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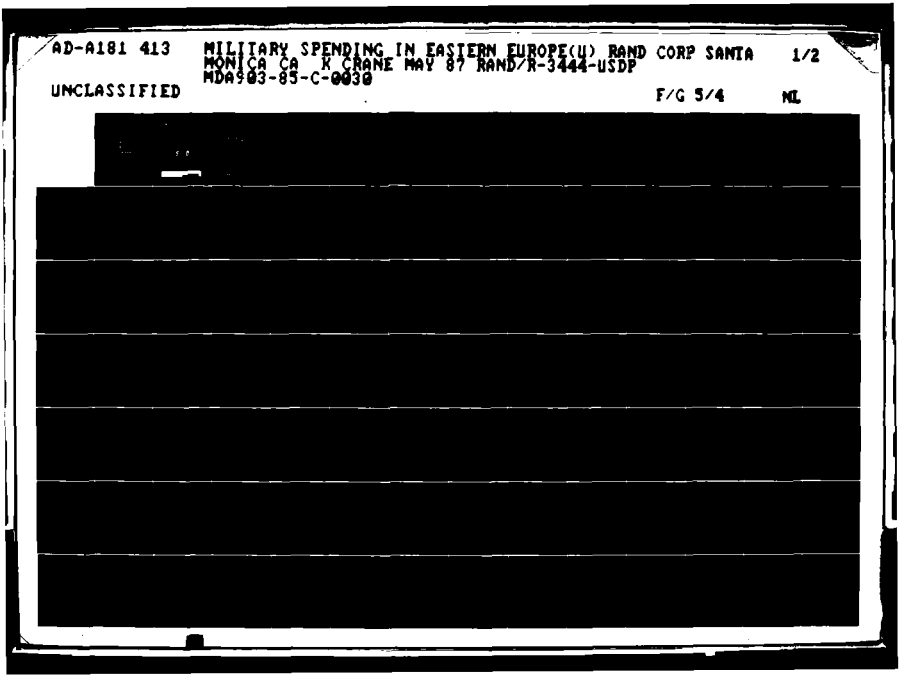

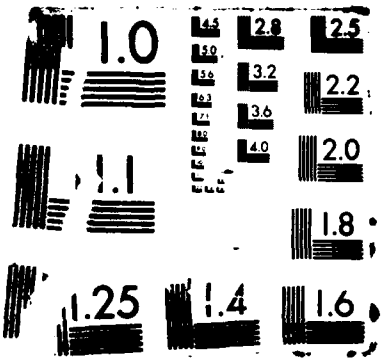
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Military Spending in Eastern Europe

Keith Crane

RAND

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for Policy

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PREFACE

This report provides estimates of military expenditures for the Northern Tier countries of the Warsaw Pact (Czechoslovakia, the German Democratic Republic, and Poland) and Hungary, assesses the political and economic factors that determine these spending levels, and discusses the probable course of military spending in these countries over the next several years.

The study was prepared for the Office of the Under Secretary of Defense for Policy under RAND's National Defense Research Institute, a Federally Funded Research and Development Center supported by the Office of the Secretary of Defense. It is part of RAND's research program on international economic policy and should be of interest to policymakers, intelligence officers, and scholars concerned with Non-Soviet Warsaw Pact military expenditures and forces and military spending decisions in Eastern Europe.

SUMMARY

Although the Soviet Union is the most threatening potential NATO adversary, its Warsaw Pact allies contribute substantially to Warsaw Pact capabilities. Military expenditure decisions by the Non-Soviet Warsaw Pact (NSWP) governments are the primary determinant of the size of these contributions. Unfortunately, little is known of the actual amounts of these expenditures or how they are determined.

This study attempts to pierce the veil thrown over military expenditures in Eastern Europe. Military budgets are reconstituted for four East European countries, Czechoslovakia, the German Democratic Republic, Hungary, and Poland for the 1965–1984 period by analyzing East European national income accounts, industrial output statistics, input-output tables, cost-of-living, and trade data. Because the East Europeans provide so little information on military spending, the estimates are based on inference, analogy, logic, and consistency tests. Consequently, they are tentative and should be treated as such.

These estimates and a review of the Western literature on East European military spending suggest that the defense budgets reported by the East Europeans contain most major components of military spending: personnel, procurement, operations and maintenance, and, possibly, construction. Aside from some enlistment and pension costs, the major spending category that is probably financed outside the reported defense budgets is military research and development, although military goods producers receive preferential treatment in terms of investment and subsidization. RAND estimates of the Czech, Hungarian, and Polish defense budgets are in general somewhat more than those countries report. Considering the margin of error involved in these estimates, they are surprisingly close to the reported budgets and strongly indicate that actual military spending in these countries is not a multiple of the reported budgets, as it is in the Soviet Union. Because of the paucity of national income accounting, trade, and industrial output data, estimates for the GDR were confined to personnel and operations and maintenance costs. These costs take roughly the same share of the reported defense budgets as in the other three countries, suggesting that the reported GDR budget may also encompass almost all actual spending.

A statistical analysis of factors that may determine military spending levels in Eastern Europe indicates the primary determinant of military spending is available resources—utilized national income. Despite the importance of economic wherewithal in

determining military expenditure levels, Western policies designed to limit East European economic growth would have little influence on military spending. Although increases in utilized national income may lead to increases in military spending, with the exception of the GDR, the percentage of military spending in utilized national income (UNI) has fallen in these countries as they have become richer.

Because East European military spending appears to be so closely tied to increases in utilized national income, the prospects for large surges in military spending in the next few years are low. Poor economic prospects in Czechoslovakia and Hungary may forestall more rapid rates of increase in expenditures. The GDR will probably be able to continue to increase expenditures at a rapid rate, but worsening prospects for hard currency export growth and a backlog of investment projects may lower the present large annual increases. Poland faces the same economic problems as Czechoslovakia and Hungary, but the deterioration in Polish military equipment and the prominent role of the military in the government may accelerate military spending.

ACKNOWLEDGMENTS

Insightful comments and criticisms were provided by RAND colleagues Abraham Becker, A. Ross Johnson, and Steven Popper. Thomas Clements of the Defense Intelligence Agency and the staff of L. W. International, especially Gregor Lazarczik, generously gave of their time, information, and suggestions. Much of this report builds on their past work. Edward Hewett of the Brookings Institution and George Stahler of Cornell University provided advice and assistance in obtaining data. Many other policymakers and scholars took the time and trouble to discuss East European military spending with me. I am grateful to all of them.

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I. INTRODUCTION

THE PROBLEM

Most efforts of Western researchers analyzing the Warsaw Pact have been directed toward the Soviet Union; the Non-Soviet Warsaw Pact (NSWP) has been relatively neglected. Yet NSWP forces would be an essential component in most plausible scenarios for a Warsaw Pact attack on Western Europe. Although Soviet armies would probably spearhead such an invasion, Soviet military planners appear to have assigned important roles to East German and Polish troops in northern Germany and to the Czechs in the south.[1] In terms of numbers, the Non-Soviet Warsaw Pact armies field 859,000 men, of which 655,000 are members of the forces of the Northern Tier (Czechoslovakia, East Germany, and Poland), more than the 565,000 Soviet forces in the region.[2] NSWP air defenses are firmly integrated with Soviet operations in the area and NSWP air forces provide substantial contributions to Soviet forces.[3] Moreover, two East European countries, Poland and Czechoslovakia, are important producers of arms and military material.[4] The Soviet Union exports large quantities of munitions and equipment to these countries, permitting increased economies of scale in its arms production and easing its military burden. The NSWP also provides the Soviet Union with a large reservoir of men and industrial capacity on which to draw in case of war. Thus, the NSWP, especially the Northern Tier of Czechoslovakia, the German Democratic Republic, and Poland, contributes greatly to Soviet military might.

Despite these contributions, the Eastern European military is often perceived as a flawed asset. Some Western political scientists doubt the reliability of NSWP forces in an East-West conflict.[5] Outmoded NSWP equipment also calls into question the quality of these forces. Air forces continue to be composed largely of MiG-21s, tank forces of T-54s or T-55s, models first produced in the early 1960s.[6] The rate of

[1]Lewis, 1982, p. 292.

[2]*The Military Balance, 1983-1984*, pp. 18–23.

[3]Lewis, 1982, p. 112; *The Military Balance, 1983-1984*, pp. 18–23.

[4]Rice, 1984.

[5]Volgyes, 1982a, pp. 85–86; Stachow in Gabriel, 1983, pp. 241–247.

[6]*The Military Balance, 1983-1984*, pp. 18–23.

modernization in recent years has continued to lag that of the Soviets, leaving the East Europeans further behind.[7]

Western military analysts have to weigh these qualitative and quantitative factors in assessing the threat posed by the NSWP military effort. War-gaming, reliability assessments, weapon effectiveness indexes, and numerical comparisons of force levels have all been used to assess the threat. Another approach has been economic: to estimate the dollar cost of NSWP military spending. This technique uses U.S. prices to weight the various components of the NSWP military (personnel, operations and maintenance, procurement, etc.) then sums them to estimate the theoretical cost to the United States of duplicating the NSWP military effort.

Both the Defense Intelligence Agency and the Central Intelligence Agency make these estimates for the Soviet Union. Western policymakers use time series of the resulting figures to help measure the Soviet threat. Similar estimates, although at a lower level of effort, have been made for the NSWP.[8]

These estimates of the U.S. factor cost of NSWP military efforts are inadequate for analyzing the *burden* of military spending on these economies and the determinants of spending levels. That calls for a different metric. When making decisions concerning expending more money on the military, East European policymakers assess the tradeoffs between the military and other needs. These budgetary decisions, which determine the quantities and types of equipment, operating tempos, and personnel levels are made in domestic prices in domestic currencies. This military *burden*, the forgone present or future output and consumption imposed by military spending, can be calculated using only costs computed in domestic prices, not U.S. costs, by reconstructing NSWP defense budgets in domestic currencies.

PAST RESEARCH

Our present knowledge of East European defense expenditures is limited. Alton et al. (1977, 1980, 1981, and 1985) have done the most extensive work in the area. They have attempted to break down the defense figures published in the national budgets of the East European countries into the various components of military spending. They have managed to calculate figures for personnel costs and constructed estimates of spending on military research and development (R&D) but have made little progress in calculating procurement costs.

[7]Herspring, 1985, pp. 21–23.

[8]Clements, 1978.

Montias (1974) has estimated Soviet arms trade within the Council for Mutual Economic Assistance (CMEA) from CMEA trade data. Vanous (1984) has continued work in this area. Montias calculates the unidentified commodity residual in Soviet trade with Eastern Europe, in CMEA trade Nomenklature Group VII (Building Materials, Construction Parts, and Unspecified) under the assumption that it comprises arms. Vanous breaks down this residual on the basis of differences in machinery trade statistics between the individual East European countries and the Soviets. The resulting figures are given in transferable rubles, a unit of account used in Eastern Europe to measure trade flows. Because trade prices of goods in Eastern Europe often differ markedly from domestic costs, these figures are suggestive but have limited value in estimating military burden.

Michael Checinski, formerly a member of the faculty of the Polish Military-Political Academy, (1974, 1981, 1982) has written extensively on military production decisionmaking in Poland and the Soviet Union. Eugen Loebel, formerly a Czech banking official, has researched Czech military expenditures. However, Checinski's work is only tangentially related to the makeup and size of military budgets and Loebel's work remained in Czechoslovakia when he left that country.

Thomas Clements of the DIA has made detailed cost estimates of major identifiable NSWP programs using NSWP prices.[9] Because many of the data used to construct these estimates are classified, these burden estimates cannot be replicated by scholars outside the government. These estimates are the only such available; their major drawback is that procurement, operations and maintenance, and construction costs are based on dollar estimates, which are converted to domestic currencies using purchasing power parity exchange rates. The dollar costs of NSWP equipment are derived by asking U.S. manufacturers to estimate the cost of producing the item in the United States. Consequently, U.S. factor prices are used instead of East European factor prices, which introduces some error into the estimates. The purchasing power parity exchange rates used were constructed by Kravis et al. (1982) and have been calculated for only a few of the East European countries. They have not been calculated for military goods. Consequently, the use of these exchange rates probably introduces additional error into the estimates.

The International Institute for Strategic Studies (IISS), the Stockholm International Peace Research Institute (SIPRI), and the United States Arms Control and Disarmament Agency (ACDA) provide figures

[9]Clements, 1985, p. 451.

on military spending in Eastern Europe. IISS reports the defense budgets announced by the East European governments, converting them to dollars using purchasing power parity exchange rates employed by Alton (1974) or the International Monetary Fund.[10] No attempt is made to judge the accuracy of the reported defense budgets. SIPRI does the same.[11] ACDA employs figures provided by other U.S. government agencies. These are presumably calculated using the building block method.

Much more extensive research on the burden of defense has been conducted for the Soviet Union. Several of these approaches are used in the analysis of East European expenditures below.

The Central Intelligence Agency uses the building block method to estimate Soviet defense expenditures in rubles. This technique gives a measure of "burden" because expenditures are estimated with Soviet prices. The Defense Intelligence Agency attempts to estimate ruble expenditures by analyzing the Soviet national budget. Becker (1964) and others[12] have attempted to reconstruct Soviet military spending using the residual approach, subtracting identifiable uses of output from Soviet national income or budget statistics under the assumption that in certain categories the residual equals military spending. Using a variation of this approach, Lee (1977), Cohn (1978), and Bond and Levine (1982) have attempted to calculate military production and procurement by estimating Soviet machinery production for final use and then subtracting out investment goods, exports, and consumer durables. The remainder is assumed to encompass domestic procurement of military durables. Wiles (1985) has written a provocative work reviewing some of this literature and presenting his own results.

These types of analysis have not been widely used to study the burden of defense in Eastern Europe. Yet the smaller size of the East European economies and, in some cases, superior economic statistics should make it easier to estimate military expenditures and their economic effect. Military research and development costs are limited and costs of strategic forces nonexistent for Eastern Europe. Moreover, most of Eastern Europe's weapons are imported rather than produced domestically, so trade statistics should provide information on military procurements lacking for the Soviet Union.

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[10]*The Military Balance 1982-1983*, p. vi.

[11]SIPRI, 1983, p. 134.

[12]Bornstein et al., 1961.

OUTLINE OF RESEARCH

The purpose of this study is to remove some of our present ignorance concerning the size and composition of NSWP military expenditures utilizing East European statistics. The study is confined to four countries—Czechoslovakia, the German Democratic Republic, Poland (the Northern Tier), and Hungary, because of time, data limitations, and their military importance.

The study first constructs military expenditure estimates for personnel, procurement of military durables, operations and maintenance, and research and development costs. The second section attempts to ascertain the validity of the reported defense budgets in these countries using assessments by emigre and Western researchers, consistency checks, and comparisons of the reported budgets with independent estimates. Figures for the burden of defense are then used to ascertain what factors policymakers in these countries weigh when determining military expenditure levels. It concludes with a brief assessment of the likely path of military spending in these countries over the next several years.

THE POTENTIAL FORMS OF STATISTICAL DECEPTION

Leaders of countries with centrally planned economies have great control over their statistical reporting systems and also tend to use economic performance as a measure of their overall performance. Because they have the capability and incentives to manipulate their statistics, and because some statistical series in some countries appear to be inaccurate, a few Westerners have speculated that the Soviets and East Europeans keep two sets of books, one for propaganda and one for operational use. Becker (1964) notes that if this is the case most Western (and Eastern) economic analysis would be impossible because the falsified data would render the analysis meaningless.

In the case of Czechoslovakia, East Germany, Hungary, and Poland this hypothesis can be rejected. The two way stream of former employees of central statistical offices who have emigrated to the West and of Western scholars who have been granted access and worked within the central statistical offices and economic research institutes in these countries has shown the two sets of books argument to be false.

This being the case, military spending in these countries must exist somewhere within the published national statistics, albeit in disguise. Becker categorizes the ways by which this statistical deception may

occur: secreting, distortional screening, and masking.[13] Secreting, which on the basis of this study appears to be the most commonly used method in Eastern Europe, consists of placing military spending in categories not openly reported. Upper bounds for these categories can often be calculated by subtracting disaggregated totals from aggregates to calculate residuals. Distortional screening involves identifying the category but combining it with other items in order to mislead the reader. Masking involves giving a category a false name. For example, the Czechs appear to mask arms exports under the category of "Other Special Machinery" in their trade statistics.

This study attempts to pierce the veil created by these forms of statistical deception. Because the East Europeans provide so little information on military spending, the estimates are based on inference, analogy, logic, and consistency tests. Consequently, the expenditure estimates are tentative and should be treated as such. Since most are estimated from residuals, they should be treated as upper bounds. These estimates are a first step; I hope and expect others will be able to build on this work and piece together more accurate estimates. Possibly, these four countries will follow the lead of Romania, another member of the Warsaw Pact, which has begun to supply information on procurement, operations and maintenance, personnel, and other costs by service.[14] Such a move would create greater trust between East and West and make East European security initiatives more credible.

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[13]Becker, 1964, p. 2.

[14]United Nations General Assembly, 1985, p. 32.

II. THE COMPOSITION OF EAST EUROPEAN MILITARY SPENDING

WHAT IS REPORTED?

The information provided by these four East European countries on military spending is minimal (Table 1). All four publish figures for budgeted aggregate military spending. All but the German Democratic Republic also report realized expenditures in the statistical yearbooks. Of the four countries analyzed, Czechoslovakia provides a further breakdown into expenditures by the Czech lands, Slovakia, and the federal government. Alton et al. (1980) argue that the figures for the individual republics may include expenditures on border guards or cover purchases of military supplies from enterprises under republic rather than national jurisdiction. They also argue that Czech expenditures may be reported net of earnings by the military from non-budgetary sources rather than gross, although the difference is probably very small.[1]

The GDR published no figures on defense spending until 1960 when the percentage of the national budget allocated to defense and security was published. Actual budgetary totals for defense and security have been published since 1968; figures just for defense have been published since 1977.[2] The figures in Table 1 are estimates of defense spending for years before 1977 and the official published statistics for subsequent years.

Hungary provides only a single figure for defense spending and another for defense incomes, presumably payments by enterprises for labor supplied by the military.

Poland publishes budget figures for current military spending and spending on military investment. These figures for military investment are probably limited to military construction. Half of this figure is spent on military housing;[3] the remainder is so small that it patently excludes procurement; it may cover construction costs of military bases. Like Hungary, Poland also publishes figures for military earnings.

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[1]Alton et. al. 1968, p. 136. Soldiers in Eastern Europe frequently spend part of their enlistment working on construction projects or helping with the harvest. Enterprises pay the military for the labor of these soldiers. Polish military earnings from these activities run less than 1 percent of the reported budget.

[2]Alton et al., 1980, p. 3.

[3]*Zolnierz Wolnosci*, June 24, 1976, p. 3, as cited in Alton, 1982, p. 420.

Table 1

REPORTED EAST EUROPEAN AND SOVIET MILITARY SPENDING BUDGETS
(Millions of domestic currencies)

	Czechoslovakia		The GDR		Hungary		Poland		USSR	
Year	Koruna	1970 = 100	Marks	1970 = 100	Forints	1970 = 100	Zlotys	1970 = 100	Rubles	1970 = 100
1960	8783	58.9	1000	17.5	3100	31.5	14920	41.8	9,300	52.0
1961	9512	63.8	1000	17.5	3376	34.3	17019	47.6	11,600	64.8
1962	10854	72.8	2700	47.3	4913	49.9	18379	51.4	12,600	70.4
1963	11332	76.0	2800	49.0	6500	66.0	20695	57.9	13,900	77.7
1964	10217	68.5	2900	50.8	6163	62.6	21881	61.2	13,300	74.3
1965	10125	67.9	3100	54.3	5757	58.5	23255	65.1	12,800	71.5
1966	10841	72.7	3200	56.0	5219	53.0	25213	70.6	13,400	74.9
1967	12385	83.0	3600	63.0	5433	55.2	26438	74.0	14,500	81.0
1968	13189	88.4	4814	84.3	6440	65.4	30332	84.9	16,700	93.3
1969	14268	95.6	5229	91.5	7644	77.6	33519	93.8	17,700	98.9
1970	14919	100.0	5712	100.0	9848	100.0	35724	100.0	17,900	100.0
1971	15943	106.9	6019	105.4	9891	100.4	37684	105.5	17,900	100.0
1972	16770	112.4	6217	108.8	9430	95.8	39490	110.5	17,900	100.0
1973	17647	118.3	6571	115.0	9488	96.3	42290	118.4	17,900	100.0
1974	18071	121.1	6746	118.1	10564	107.3	46353	129.8	17,700	98.9
1975	19728	132.2	7154	125.2	11811	119.9	50204	140.5	17,400	97.2
1976	20365	136.5	7613	133.3	11671	118.5	54242	151.8	17,400	97.2
1977	20130	134.9	7868	137.7	12607	128.0	60932	170.6	17,200	96.1
1978	20808	139.5	8261	144.6	14983	152.1	63255	177.1	17,200	96.1
1979	21380	143.3	8674	151.9	16200	164.5	68192	190.9	17,100	95.5
1980	22900	153.5	9403	164.6	17700	179.7	71572	200.3	17,100	95.5
1981	23099	154.8	10145	177.6	19060	193.5	80560	225.5	17,100	95.5
1982	24560	164.6	10776	188.7	20200	205.1	186180	521.2	17,100	95.5
1983	25261	169.3	11401	199.6	21900	222.4	201380	563.7	17,100	95.5
1984			12222	214.0	22700	230.5	263400	737.3		
1985			13041	228.3			325170	910.2		

SOURCES: Czechoslovakia and Hungary—Statistical Yearbooks; Poland—Statistical Yearbook, National Budgets, and Alton et al., 1980; The German Democratic Republic—Alton et al., 1980, Statistical Yearbooks; The Soviet Union—Becker, 1985, p. 4.

Alton et al. argue that since 1972 the figure on military investment is not included in the actual government expenditures reported in the statistical yearbook.[4] Table A.10 in App. A appears to bear out Alton's contention: Figures for expenditures by the Ministry of Defense are greater than those reported for national defense in the yearbook by roughly the amount budgeted for military investment since this date.

[4]Alton et al., 1980, p. 4.

For this reason, my post-1972 estimates of total military spending were constructed by adding budgeted spending for military investment to the military expenditure figure given in the yearbook.

WHERE ARE MILITARY EXPENDITURES LOCATED?

Soviet Expenditures

The location of these reported and possible other hidden expenditures in the national income accounting statistics of centrally planned economies has been a matter for speculation and debate for quite some time. Conventional wisdom places Soviet expenditures on food, clothing, and other consumption items for military personnel in the personal consumption category.[5] Costs of materials used in the maintenance of military facilities, current operations, and research and development are assumed to be in general consumption. Procurement of military durables are thought to fall under accumulation, probably under changes in reserves.[6] This is consistent with the Chinese practice of placing capital expenditures on equipment and construction by the military within accumulation.[7] Increases in state stockpiles for military reasons are also included in accumulation, under increases in state reserves.[8]

East European Expenditures

The Poles, Czechs, and Hungarians appear to take a different view. Jilek, the head of a Czech economic institute, states:

> Social consumption represents on the one hand consumption of the state organizations (administration, defense, security, courts, etc.), on the other, consumption of institutions rendering services that are either free (health, education, scientific institutions and others) or paid for (communal enterprises, passenger transportation, etc.).[9]

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[5]Utilized national income is divided into consumption and accumulation in the Marxist national income accounting system. Consumption is subdivided into personal consumption and material consumption by institutions and organizations of the nonmaterial sphere, henceforth shortened to "general" consumption. The latter is split into consumption by institutions providing services consumed by individuals and consumption by institutions satisfying common, collective needs (Statistical Office of the United Nations, 1971, p. 59).

[6]Gallik et al., 1979, p. 427; Becker, 1964.

[7]World Bank, 1981, p. 27.

[8]Statistical Office of the United Nations, 1971, p. 20.

The Polish statistical authorities state that consumption of material goods by organizations that provide for national defense is recorded under "Other Consumption of a General Social Character."[10] This categorization is consistent with the *Basic Principles of the System of Balances of the National Economy*, which states that this category includes "the consumption of material goods by institutions meeting the collective needs of the community."[11] Since the Polish statistical authorities state that personal consumption consists of items *purchased* by or produced by the population for their own consumption, this implies that (in contrast to the conventional wisdom concerning the Soviet Union) military consumption of food, clothing, and personal items is included within the general consumption category, rather than under personal consumption, in the same way that food consumed in hospitals or schools falls under general consumption.[12]

The Hungarians are not as forthcoming as the Poles concerning the location of military spending within national income. They have, however, published detailed annual input-output tables between 1969 and 1979 and also in 1981 and 1982. These I-O tables are for gross domestic product (GDP), rather than for net material product (NMP). One of the three service categories—communal, administrative, and other services—appears to contain military spending. Global output of this sector corresponds very closely to central government expenditures on administration, law enforcement, economic tasks, and the military; the difference between the two averages 1.8 percent of the budgetary total.[13] Furthermore, the structure of inputs into this sector is consistent with military activities. Since Hungary has virtually no domestic arms industry,[14] arms must be imported. Imports recorded in this category averaged 4.5 times more than for other service sectors, even though the global output of these sectors was of comparable size.

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[9]Jilek, 1960, p. 277.

[10]*Rocznik Statystyczny*, 1985, p. 75.

[11]Statistical Office of the United Nations, 1971, p. 55.

[12]Further evidence for this conclusion was found in the 1981 version of the 1977 Polish input-output table, which included services (*Rocznik Statystyczny*, 1981). Agricultural and food industry inputs were recorded for health and education services. Since material inputs into these service industries are recorded in the general consumption category, food and clothing purchased by the military are also probably recorded in this category. This table hints that the military is considered to produce a service; the input column for scientific, administrative, and other services contains nothing but zeros. One would assume that the authorities had decided to conceal these data presumably because they may be connected with military expenditures. These inputs may be hidden in the column, "Other Elements of Final Demand," which includes general social consumption, consumption in kind from social funds, changes in reserves, and errors and omissions.

[13]See App. A for the data and a more detailed discussion.

[14]Rice, 1984, p. 73.

These import data were also consistent with both the military budget and other estimates of arms imports. Moreover, this sector consumes significant quantities of petroleum products, an important item for military operations, substantially more than other service and most industrial sectors.

Hungary also publishes figures on utilized national income according to the system of material balances. In this system services that do not enter the production of material goods do not contribute to material consumption. Material inputs that go into the production of these services are recorded in "Collective Consumption." If military spending is recorded as a service in the GDP accounts, which seems to be the case, material inputs into the military would be recorded in "Collective Consumption" in the NMP accounts along with material inputs to such other service industries as health and education.

The GDR is not forthcoming concerning the location of military spending.

Military Durables

Procurement of military durables in the four countries may fall either into the change in inventories category, investment, or general consumption. I believe the data support the last hypothesis. As noted above, this is where the Czech and Polish statistical office states that material consumption of the armed forces is recorded.[15] The *Basic Principles of the System of Balances of the National Economy* also states, "The material consumption of institutions satisfying the common collective needs of the community (other categories of final consumption) includes the consumption of goods necessary for their operation, together with the depreciation of their fixed assets."[16] If the military, like law enforcement agencies, is assumed to provide a service, this rule should apply. Moreover, military equipment is not depreciated in Poland; military durables, like consumer durables, are assumed to be consumed upon purchase, so putting military durables into general consumption is consistent with Polish accounting practices.[17] In other words, equipment purchased for service industries, such as medical equipment or police cars, would be treated as "soft" goods—immediately depreciated—and fall under collective consumption. Buildings and other structures would fall under accumulation.

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[15]*Rocznik Statystyczny*, 1985, p. 75.

[16]Statistical Office of the United Nations, 1971, p. 59.

[17]Feiwel and Wynnczuk, 1971, p. 262.

The evidence that the procurement of military durables could be located in changes in inventories consists of the sole statement concerning military expenditures in the *Basic Principles of the System of Balances of the National Economy*, which states that the category "changes in stocks and circulating capital" in the national income tables includes "state stockpiles (including defense items)."[18] This cryptic statement may imply that all defense items are included in changes in reserves or only those items that would fall under strategic reserves, i.e., military stockpiles of commodities, or some combination of the two are included.

Military procurement does not appear to fit into breakdowns of investment spending. Military construction, but not procurement of arms, appears to be included within gross investment in Poland. Since 1975 the expenditures on construction listed in the national budget fit neatly into the "Other Investment" category in the investment series.[19] There is no room for Polish military procurement in the investment figures, however. Hungarian investment breakdowns also do not leave enough room for the procurement of military durables.

Figures for general consumption are large enough to cover Czech, East German, Hungarian, and Polish procurement estimates derived from either the reported budget or industrial output residuals plus arms imports estimates.

Input-output table figures for changes in inventories seem too small to cover military procurement.[20] Increases in machinery inventories, imports, and domestic production run from one-fourth to one-half the total reported military budget in Czechoslovakia and average 25 percent in Hungary (Table 2). If the reported budgets reflect actual expenditures correctly, or understate actual spending, these figures seem too low for the procurement of military durables; in Western experience, procurement runs more than one-third of military spending. My estimates of procurement of military durables also run one-third to one-half the reported budget (Table 2).[21] Moreover the reported inventory figures imply that if military durables are recorded as increases in machinery inventories, there has been a steady decline in other machinery inventories in Czechoslovakia and Hungary for the past 20 years. This stretches belief.

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[18]Statistical Office of the United Nations, 1971, p. 20.

[19]See App. A for a more detailed discussion of this point and supporting data.

[20]Since the input-output tables of these three countries are fairly consistent with other national income data (Polish and Czech tables are in producers' prices rather than purchase prices, so the correspondence is not identical), increases in military durables ought to be in the increases in inventories from the machinery sector; otherwise the I-O tables would be inconsistent.

[21]Also see App. A.

Table 2

THE RATIO OF CHANGES IN INVENTORIES TO REPORTED DEFENSE SPENDING
(Percent)

	Czechoslovakian Inventories		Hungarian Inventories		Polish Inventories		
Year	Total	Machinery	Total	Machinery	Total	Machinery	GDR Inventories[a]
1960	48.04		268.5		179.0		235
1961	98.12		321.2		193.3		118
1962	93.37	47.2	221.8		117.5	78.1	147
1963	62.55		166.5		164.3		82
1964	14.59		227.6		164.5		110
1965	-1.42		166.7		188.8		121
1966	73.41		197.2		186.8		148
1967	95.26	22.9	324.8		139.2	56.6	106
1968	91.93		229.6		146.7		20
1969	100.83		175.6		103.5	63.8	22
1970	126.57		116.8	43.7	123.2		72
1971	92.54		225.0	83.1	166.6		72
1972	70.05		84.9	37.2	166.6		68
1973	72.07	25.1	75.3	12.9	205.7		73
1974	106.03		256.4	31.3	245.3		78
1975	109.08		177.8	26.0	203.2		60
1976	108.77		193.6	18.1	238.4		64
1977	48.32	35.5	144.4	6.0	152.6	72.6*	67
1978	60.62		307.7	8.5	152.1		33
1979	113.65		77.8	-1.8	86.5		11
1980	156.86		76.8		56.6	61.8	
1981	54.70		129.1	13.7	-7.2		
1982	57.67	49.6	138.1		232.7	33.1	
1983	67.41		78.1		168.5		
1984			116.3		180.8		

[a]My estimate. For details, see App. B.

Increases in Polish inventories originating in the machine-building sector are higher than those of Czechoslovakia and Hungary, running from 30 to 80 percent of the reported military budget and averaging two-thirds. These figures still seem too low to encompass expenditures on both civilian machinery inventory increases and the procurement of military durables.

If military durables are recorded under inventory investment, they would not necessarily fall under machinery inventories. They could be lodged in miscellaneous categories. Consequently, changes in *total*

inventory investment were also compared with the reported military budgets. Figures for changes in total inventories for these countries do not seem large enough to cover both inventory investment and procurement of military durables. On average changes in total Czech inventories are less than the recorded military budgets (Table 2). A rough and ready calculation of inventory changes[22] indicates that GDR inventory growth has also been less than consistent with reported defense expenditures, ranging from 10 to 250 percent of the military budget and averaging 85 percent. Since 1979, changes in Hungarian inventories have been somewhat more than the defense budget, but most of these changes are accounted for in detailed breakdowns of industrial stocks. Input-output tables indicate most of the remainder consists of agricultural inventories.

Polish figures could cover procurement of military durables or may merely reflect poorer control of inventories than in the other three countries. Changes in total Polish inventories average 158 percent of the reported military budget. If one-third of the reported budget (which seems conservative) is spent on procurement, on average about 20 percent of increases in total inventories would go for the military.

The year to year fluctuations in inventories also appear inconsistent with military spending trends. If one assumes that procurement of military durables takes a more or less constant share of military spending and that the reported military budgets ran a more or less constant share of actual spending, changes in reported military spending should be positively correlated with changes in inventories, even after allowances are made for increases in both categories due to inflation and economic growth. In order to examine this hypothesis, I regressed nominal changes in inventories on recorded military budgets and nominal utilized national income.[23] The coefficients for Czechoslovakia, the GDR, and Hungary were negative, indicating that increases in inventories tend to correspond to *declines* in reported military spending. Only the coefficient for Poland was positive.

A DECOMPOSITION OF EAST EUROPEAN MILITARY BUDGETS

Below I have attempted to decompose East European military expenditures, primarily by constructing residuals and imposing consistency tests.

[22]The details are provided in App. B.

[23]The data and regression results are discussed in detail in App. C.

For the purposes of this study, military expenditures are confined to personnel, operations and maintenance, and procurement costs with the addition of military construction in the case of Poland. Because of data limitations not all these costs were made for East Germany. No attempt was made to provide military construction costs for countries other than Poland nor to estimate administration costs. Personnel was defined as all forces financed by the Ministry of Defense. This includes border guards in the case of Czechoslovakia, the GDR, and Hungary but excludes Polish border guards because these troops are reportedly financed by the Ministry of the Interior.[24] Estimates for military research and development and arms trade were also made. The former appears to be funded by agencies other than the Ministry of Defense and therefore is excluded from comparisons of reported and estimated military spending. Alton et al. (1980) have estimated military personnel costs that appear to be funded outside the budget of the Ministry of Defense. No attempt was made to estimate or include these costs here.

Personnel Costs

A technique suggested by Alton et al. (1981) was used to calculate personnel costs. Estimates of the numbers of military personnel[25] were multiplied by cost of living and salary data to construct personnel expenditures (Tables 3–6).[26]

These figures are probably the "hardest" of the estimates made here. The actual salaries and costs of feeding and clothing military personnel must lie within a small margin of these estimates. The greatest margin of error stems from the estimates of personnel numbers, not the salary or per capita consumption cost estimates. In some cases changes in figures from one year to another may be due to better intelligence rather than to actual changes in force levels.

Procurement of Military Durables

The procurement estimates in Tables 3–6 are restricted to military equipment; such items as light industrial products are captured in the figures for personnel costs. Ammunition and petroleum, oil, and

[24] *The Military Balance*, various years.

[25] Military personnel figures were derived by summary estimates from *The Military Balance* of "Total Regular Forces" and "Para-Military Forces," which appear to be funded by the Ministry of Defense. Forces funded by the Ministries of the Interior and of State Security are small relative to the total military.

[26] Appendix A describes this procedure and these data in more detail.

Table 3

RECONSTRUCTED CZECHOSLOVAKIAN MILITARY BUDGETS
(Millions of koruna)

Year	Estimated Budget as a Percentage of Reported Budget	Estimated Military Budget	Personnel	Operations and Maintenance	Procurement		
					Total	Domestic	Imports
1960	NA	NA	NA	NA	3560	3260	300
1961	NA	NA	NA	NA	3900	3530	370
1962	NA	NA	NA	NA	4190	3750	440
1963	NA	NA	NA	NA	6220	5770	450
1964	NA	NA	NA	NA	6440	5910	530
1965	128.2	12980	3130	3130	6730	6110	620
1966	117.8	12770	2950	2950	6860	5810	1040
1967	118.4	14660	3180	3180	8310	7380	930
1968	108.8	14350	3500	3500	7360	5720	1640
1969	109.0	15550	3910	3910	7720	6010	1710
1970	94.6	14110	2900	2900	8300	6340	1950
1971	99.2	15810	3310	3310	9190	7070	2120
1972	101.0	16930	3450	3450	10040	7630	2410
1973	94.5	16670	3630	3630	9410	5410	4000
1974	105.4	19050	3960	3960	11130	6840	4290
1975	108.4	21380	4620	4620	12140	7350	4790
1976	98.0	19960	4130	4130	11700	6570	5130
1977	100.5	20240	4240	4240	11760	6420	5340
1978	108.3	22530	4530	4530	13470	7120	6360
1979	106.8	22830	4720	4720	13380	7540	5840
1980	102.5	23480	4840	4840	13800	7870	5920
1981	103.2	23830	4930	4930	13970	8320	5650
1982	105.8	26000	5160	5160	15680	9210	6470
1983	109.1	27550	5610	5610	16330	9630	6700
1984	NA	NA	5810	5810	NA	NA	7350
Average	106.3						
Standard Deviation	8.2						

SOURCE: See App. A for details.

lubricants (POL) are assumed to be captured in the figures for operations and maintenance. Estimates of purchases of domestically produced military equipment were added to estimates of imports of military durables to obtain figures for total procurement of military durables. Because these estimates are derived from residuals that probably include other items than military equipment, they should be treated as upper bounds.

Purchases of domestically produced military durables were estimated from input-output tables. As noted above, the category "Communal, Administrative and Other Services" in Hungarian input-output tables, which are for GDP rather than NMP, appears to contain military services. Figures for machinery inputs in this column were used to place an upper bound on domestically produced military procurement under the assumption that machinery is not used in the production of administrative or economic services. This imparts an upward bias to the estimate because law enforcement services are also found in this column. Police forces do use some machinery, but no good way was found to net out law enforcement purchases. Automobiles, probably the most important machinery purchases by law enforcement agencies, are imported in Hungary; this failure is therefore probably of lesser importance than it would be in other countries.

Unfortunately, Czech and Polish input-output tables use the NMP rather than GDP format; material inputs in the production of services consumed collectively or by individuals enter final demand. As argued above, military procurement is probably located in that portion of the final output of the machinery and electronics industries directed to general consumption. Domestic procurement estimates for these countries were based on these figures reduced to eliminate machinery inputs used in the production of health, cultural, and educational services. The average input-output coefficients for machinery inputs into these services from the Hungarian tables were used with Czech and Polish budgetary figures to estimate machinery inputs needed for these services. These were then subtracted from the I-O figures. Coefficients for Hungary for the production of medical, cultural, and educational services are probably much the same as those for Czechoslovakia and Poland.

Perhaps an example will make this procedure clearer. Example 1 contains entries from the 1979 Hungarian input-output table. The figures in boldface type in the Hungarian table equal machinery inputs into the production of "Communal, Administrative and Other Services." These were assumed to equal domestic procurement of military durables. The figures for imports were assumed to contain imports of military equipment.

Table 4

RECONSTRUCTED EAST GERMAN MILITARY BUDGETS

(Millions of marks)

Year	Personnel & O&M Costs as a Percent of the Budget	Personnel Plus O&M	Personnel	Operations and Maintenance	Non-MOD Security Forces Personnel Costs	Arms Imports from the Soviet Union (Valuta Marks)
1962	71.1	1920	960	960	NA	NA
1963	80.8	2260	1130	1130	NA	NA
1964	83.1	2410	1200	1200	NA	NA
1965	82.1	2540	1270	1270	NA	NA
1966	85.9	2750	1370	1370	NA	NA
1967	78.8	2840	1420	1420	NA	NA
1968	61.2	2940	1470	1470	NA	NA
1969	54.5	2850	1420	1420	250	NA
1970	49.3	2810	1410	1410	240	NA
1971	45.5	2740	1370	1370	230	NA
1972	44.2	2750	1370	1370	240	NA
1973	46.2	3030	1520	1520	300	NA
1974	49.1	3310	1660	1660	310	NA
1975	47.6	3400	1700	1700	330	NA
1976	49.8	3790	1900	1900	310	NA
1977	50.1	3950	1970	1970	360	NA
1978	48.5	4000	2000	2000	370	NA
1979	47.8	4140	2070	2070	380	NA
1980	45.6	4290	2140	2140	380	2143
1981	44.8	4550	2270	2270	370	2316
1982	42.4	4570	2280	2280	430	2793
1983	41.3	4710	2360	2360	420	2466
1984	40.4	4940	2470	2470	430	NA
Average	56.1					
Standard Deviation	15.2					

SOURCE: Personnel and Operations and Maintenance—author's estimates. See App. A for details. Trade data—Vanous, 15 August 1984, converted to valuta marks.

Table 5

RECONSTRUCTED HUNGARIAN MILITARY BUDGETS
(Millions of forints)

Year	Estimated Budget as Percent of Total Budget	Estimated Budget	Personnel Costs	O&M Costs	Petroleum, Oil, and Lubricants	Military Procurement		
						Total	Domestic	Imports
1965	123.0	7080	2270	2270	NA	2530	340	2190
1966	141.8	7400	2440	2440	NA	2510	350	2160
1967	127.8	6940	2270	2270	NA	2400	370	2030
1968	121.7	7840	2440	2440	NA	2960	420	2540
1969	104.9	8020	2460	2460	NA	3090	460	2630
1970	80.6	7940	2580	2580	480	2790	850	1940
1971	93.4	9230	2850	2850	430	3530	670	2860
1972	108.5	10230	3030	3030	630	4170	530	3640
1973	108.6	10310	3070	3070	350	4160	500	3660
1974	114.0	12040	3180	3180	390	5670	610	5060
1975	106.3	12560	3490	3490	450	5580	480	5100
1976	101.9	11900	3160	3160	660	5570	630	4940
1977	100.7	12700	4050	4050	590	4590	780	3820
1978	95.2	14270	3770	3770	770	6720	880	5830
1979	113.8	18440	4440	4440	800	9570	700	8870
1980	78.4	13880	4050	4050	860	5790	960	4830
1981	82.6	15740	4770	4770	840	6200	970	5230
1982	84.4	17050	5480	5480	1060	6090	1210	4870
1983	87.9	19250	5370	5370	NA	8520	1600	6920
1984	NA	NA	NA	NA	NA	7920	1690	5270
Average	104.0							
Standard Deviation	16.9							

Example 1

FIGURES FROM THE 1979 HUNGARIAN INPUT-OUTPUT TABLE
(*Million forints*)

	Personal and Economic Services	Health, Social, and Cultural Services	Communal, Administrative, and Other Services
Machinery	1689	2737	**698**
. . .			
Imports	2684	2521	**14061**

Example 2 shows entries from the 1982 Polish input-output table. The sum of the figures in boldface type, other consumption of machinery (goods produced in the machine-building sector not purchased by individuals, but also not used for investment) were assumed to place an upper bound on procurement of domestically produced military durables. Some of this machinery is patently consumed in the production of health, cultural, and other services. An estimate of nonmilitary consumption of machinery in this category was constructed by taking coefficients for machinery inputs into a unit of health, social, and cultural services in Hungary[27] and multiplying it by Polish expenditures on these services. The estimate of the procurement of domestically produced military durables is equal to the difference between "Other Consumption of Machinery" and nonmilitary consumption.

Example 2

FIGURES FROM THE 1982 POLISH INPUT-OUTPUT TABLE
(Billion zlotys)

	Consumption of Material Goods	
	Personal	Other
Products of the Metal Industry	56477	**8823**
Machinery and Equipment	286	**6974**
Precision Machinery	6931	**7370**
Transportation Equipment	76613	**25606**
Products of the Electrotechnical Industry	59180	**14125**
Sum		**62898**
Machinery Used in Producing Medical and Other Services		− (.05997 × 445,100)
Total Domestic Procurement		**36200**

[27]The coefficient used was .05997, the average coefficient for the 1970–79 input-output tables. The coefficient was fairly stable. The standard deviation of the series was .00695.

Since input-output tables were not available for every year, procurement figures for years without a table had to be estimated. Coefficients for intervening years were estimated by taking the average of the coefficients of the bracketing I-O tables. Coefficients for the earliest and latest years were estimated using the coefficients of the closest year available. The coefficients were then multiplied by the figures for nonpersonal consumption provided in national income accounting data. With the exception of Czechoslovakia, these figures were almost identical to the figures for "Other Consumption" in the I-O tables.[28]

Arms Trade

Neither Hungary nor the GDR has a large domestic arms industry; most arms are imported. Poland produces military aircraft, most notably helicopters; Czechoslovakia produces jet trainers; and both produce tanks.[29] Nonetheless, like the GDR and Hungary, they import a substantial share of their procurement, mainly from the Soviet Union. Vanous (1984) claims that this trade is recorded in machinery trade by the East Europeans and in an unspecified commodity residual by the Soviets. Consequently, the difference between Soviet and East European machinery trade statistics should equal Soviet arms trade with these countries. The estimates for Polish and Hungarian arms trade in Table 7 were constructed with this method.[30]

A different methodology was used to place an upper bound on Czech arms exports. According to Vanous, the Czechs place arms trade within Standard International Trade Classification (SITC) category 718 (0ther Special Machinery).[31] Czech arms exports were estimated by subtracting identified exports in this category from the total figure (Table 7). The unidentified residual was assumed to equal arms exports. These estimates are upper bounds because part of this residual is patently not arms. For example, this method yields Czech arms exports to the EEC of $6.6 million, really unidentified exports of special machinery. The estimates also greatly exceed those of ACDA (App. A). In 1980, however, the Czechs record exports of $145.5 million to Libya in this category, of which $122.9 million is not identified.

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[28]Appendix A provides a more detailed explanation of the methodology used for Czechoslovakia.

[29]Rice, 1984.

[30]See App. A for details.

[31]This is according to the old SITC 1 classification system. Vanous (1985) argues that in the revised classification system arms trade falls into SITC 728 (other equipment specialized for particular industries), 745 (other nonelectrical machinery, tools, and parts, not elsewhere specified (n.e.s.)) and 784 (motor vehicle parts and accessories, n.e.s.). He also places unidentified machinery sales into the arms category.

Table 6

RECONSTRUCTED POLISH MILITARY BUDGETS
(Millions of zlotys)

Year	Estimated Budget as a Percent of Reported Budget	Estimated Military Budget	Personnel	Operations and Maintenance	Procurement		
					Total	Domestic	Imports
1965	96.5	22440	7490	7490	6510	3920	2590
1966	89.8	22630	7270	7270	7100	4260	2840
1967	96.2	25430	8110	8110	8260	5120	3130
1968	NA	NA	8520	8520	NA	5900	NA
1969	88.0	29490	8800	8800	10250	6540	3710
1970	81.8	29210	7840	7840	11920	7850	4070
1971	NA	NA	9670	9670	NA	8380	NA
1972	89.7	35410	10580	10580	12250	8350	3900
1973	95.5	40370	12100	12100	14330	8890	5440
1974	97.9	45370	13710	13710	15330	8850	6490
1975	100.7	50570	16650	16650	14670	7320	7340
1976	115.1	62440	17840	17840	24220	14030	10190
1977	117.8	71770	17620	17620	33280	21440	11840
1978	131.5	83160	20530	20530	38620	24510	14110
1979	131.1	89430	22140	22140	41220	26090	13840
1980	140.5	100550	23700	23700	48170	27980	18840
1981	153.4	123600	26840	26840	66260	23120	25070
1982	90.3	168050	45110	45110	67460	36200	28250
1983	NA	NA	59040	59040	NA	53920	NA
1984	NA	NA	66260	66260	NA	68940	NA
Average	107.2						
Standard Deviation	20.9						

SOURCE: Author's estimates. See App. A for details.

This figure supports Vanous's assertion. ACDA figures for Czech arms exports to Libya for the 1976–80 period ran $280 million; this method produces exports of $351.6 million.[32]

Because GDR trade data is so poor, none of these methods could be used to estimate its arms trade.

[32]ACDA, 1983.

Table 7

EAST EUROPEAN ARMS TRADE
(Millions of transferable rubles)

	Czechoslovakia				Poland			
Year	Exports	% Machinery Exports	Imports	% Machinery Imports	Exports Total	% Machinery Exports	Imports from the SU	% Machinery Imports from the SU
1965	246.2	21.0	49.5	NA	201	29.2	NA	NA
1966	344.0	28.0	54.9	NA	226	31.3	NA	NA
1967	249.3	19.9	50.8	6.9	254	31.0	NA	NA
1968	NA	NA	86.3	NA	288	30.3	NA	NA
1969	126.3	8.3	94.1	NA	333	30.1	NA	NA
1970	286.7	16.7	110.4	NA	236	18.2	NA	NA
1971	NA	NA	118.9	NA	277	18.7	NA	NA
1972	261.5	13.0	130.2	NA	272	15.9	NA	NA
1973	269.9	12.2	217.6	13.0	342	17.1	NA	NA
1974	289.6	12.0	229.8	NA	459	18.7	NA	NA
1975	334.0	11.9	330.6	NA	725	22.8	NA	NA
1976	345.0	10.6	372.0	NA	660	18.2	NA	NA
1977	143.1	3.8	402.6	9.9	609	14.4	NA	NA
1978	502.2	11.9	489.3	NA	657	13.9	NA	NA
1979	576.5	12.9	463.7	NA	665	12.0	301	23.4
1980	708.4	14.3	483.1	NA	668	13.2	387	26.0
1981	886.5	15.5	503.8	NA	435	9.0	515	35.7
1982	NA	NA	591.5	11.4	345	5.6	415	43.0
1983	NA	NA	639.8	NA	NA	NA	476	46.5
1984	NA	NA	702.3	NA	NA	NA	644	48.7

Table 7—continued

Year	The GDR				Hungary			
	Exports to the SU	% Machinery Exports to the SU	Imports from the SU	% Machinery Imports from the SU	Exports to the SU	% Machinery Exports to the SU	Imports from the SU	% Machinery Imports from the SU
1975					3	0.4	120	26.7
1976					28	3.4	125	25.6
1977					62	6.5	109	19.7
1978					NA	NA	167	24.9
1979					36	2.9	248	32.0
1980	170	37.4	459	5.7	32	2.5	142	19.1
1981	220	38.1	496	6.2	76	5.1	185	26.5
1982	284	42.4	598	7.0	82	4.8	157	20.3
1983	350	43.1	528	7.4	92	4.6	266	30.1
1984					112	4.8	203	25.7

SOURCE: GDR—Vanous, 1984. Other countries—author's estimates. See App. A.

Operations and Maintenance

Estimates of operations and maintenance costs, also given in Tables 3–6, are the least reliable of those computed. These costs generally run 50 and 100 percent of personnel costs in Western armies.[33] To put an upper bound on these expenditures the higher number was used here. Hungarian figures for POL were computed from input-output tables.[34]

Production of Military Durables

Estimates of the share of military durables production in total machinery output are given in Table 8. These were computed to provide an indication of how important arms production may be in these economies. Figures in domestic currencies and time series in constant prices are given in Table A.10. In the case of Czechoslovakia these estimates were computed by summing estimates of domestic procurement and arms exports. These figures should be considered upper bounds, like the procurement and exports figures from which they are derived. Hungarian production was assumed to equal domestic procurement, because estimates of Hungarian military exports are dubious.

Unfortunately, other means of estimation could not be found. Hungary's arms industry appears to be so small that it is very difficult to identify production. Czechoslovakia does not provide detailed information on the output of the machinery or electrical machinery industries.

The Polish figures are somewhat more solid than the Czech and Hungarian figures. Poland publishes a detailed breakdown of industrial production by industry and branch. For four of the five branches within the machinery sector, the sum of the output of the branches differed from the figures for the total output of the industry. Polish arms production figures were calculated under the assumption that these unidentified residuals encompass production of military durables. Because the figures are based on residuals, they are upper bounds. However, they exclude the production of trucks and automobiles produced by the motor vehicle industry but sold to the armed forces or purchased by foreign armies.[35] As a cross check the sum of estimated Polish domestic procurement and exports to the Soviet Union was also calculated (App. A). These figures fall into the production estimates calculated in Table 8. Discrepancies between these figures may stem in

[33]Becker, 1964, p. 120.

[34]See App. A for details.

[35]Appendix A provides a more detailed explanation of the data and assumptions employed.

Table 8

EAST EUROPEAN PRODUCTION OF MILITARY DURABLES
(Percent of global machinery output)

			Poland	
Year	Czechoslovakia	Hungary	Production	Domestic Procurement plus Exports to the SU
1965				
1966				
1967	13.2			
1968				
1969	7.8			
1970	9.9	0.87	6.41	
1971		0.63	6.45	
1972	8.3	0.45	5.74	
1973	7.8	0.39	5.86	
1974	8.5	0.43	5.96	
1975	8.4	0.29	6.96	
1976	8.3	0.36	6.35	
1977	5.4	0.41	6.39	
1978	8.0	0.42	6.58	4.26
1979	7.6	0.31	6.46	5.22
1980	8.0		6.85	6.40
1981	8.3		7.20	
1982			8.23	4.96
1983			7.81	4.69
1984			7.11	

part from the omission of Polish arms exports to countries other than the Soviet Union under Domestic Procurement plus Exports to the Soviet Union and the inclusion of some nonmilitary products under Production.

GDR statistics were too poor to attempt military production estimates. Because the country does not produce major military items such as tanks or aircraft, military production is generally believed to be small compared with that of Czechoslovakia or Poland. The Polish and Czech figures for arms production as a percent of total machinery output may provide an upper bound for the size of the GDR arms industry.

Military Research and Development

Alton et al. have estimated military R&D expenditures for Czechoslovakia, the GDR, and Poland by making various assumptions about the portion of total research and development that entails military work. They assume Hungarian military R&D to be negligible, because of the small size of the Hungarian arms industry. The estimates for the GDR were made under the assumption that 5 percent of the total R&D budget is spent on military research; 12 percent of Polish total research and development was assumed to be devoted to military research, roughly the percentage of unaccounted industrial production in Polish statistics in the 1960s. The Czech estimates assumed half of federally funded current expenditures on R&D went to the military.[36] Lack of data caused Alton et al. to choose these percentages on the basis of their best judgment.

I have explored two alternative avenues to narrow the range of feasible estimates of military R&D in these countries. The first involved decomposing nationally funded research expenditures.[37] Although the published East European budgetary data are sometimes surprisingly detailed, the R&D categories are still so aggregated that reasonable estimates of military R&D expenditures could not be obtained this way. Further study using accounts of the types of research conducted in various institutions in these countries could perhaps narrow these ranges.

The second approach involved using West European percentages of military R&D in total R&D to obtain ranges for R&D expenditures. West European countries tend to fall into three groups: members of the nuclear club, such as France and the United Kingdom, which devote about one-quarter of their total R&D to the military; armed neutrals, such as Sweden and Switzerland, which fall into an intermediate range; and nonnuclear members of NATO, such as Italy and the FRG, which devote about 4 percent of their R&D to military work.[38] Because of the large disparities in R&D expenditures by nuclear and nonnuclear states, Sweden and the FRG were chosen as analogues. Sweden, which has the higher expenditures as a percentage of total R&D, was assumed to be more similar to Czechoslovakia, the major arms producer and exporter; the FRG was assumed to be more similar to the GDR, Hungary, and Poland.

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[36]Personal communication with Gregor Lazarczik.

[37]See App. A for a detailed discussion of the data and estimates of extreme upper bounds for these expenditures.

[38]SIPRI, 1984, pp. 288–289.

Table 9

ESTIMATES OF POSSIBLE NSWP MILITARY R&D EXPENDITURES
(Millions of domestic currency)

	Czechoslovakia		GDR		Hungary		Poland	
Year	Koruna	Percent Reported Military Budget	Marks	Percent Reported Military Budget	Forints	Percent Reported Military Budget	Zlotys	Percent Reported Military Budget
1960					40	1.29		
1961					40	1.18	90	1.12
1962					50	1.02	100	1.25
1963					60	0.92	110	1.21
1964					60	0.97	120	1.19
1965					60	1.04	130	1.25
1966					60	1.15	160	1.43
1967					60	1.10	190	1.55
1968	680	5.12			70	1.09	200	1.45
1969	770	6.43			80	1.05	200	1.31
1970	830	6.62			140	1.42	190	1.20
1971	900	6.91	210	3.49	110	1.11	320	1.88
1972	960	7.31	220	3.54	90	0.95	380	2.15
1973	1040	7.53	230	3.50	80	0.84	500	2.65
1974	1000	7.10	230	3.41	100	0.95	560	2.70
1975	1100	7.03	240	3.35	80	0.68	620	2.75
1976	1130	7.06	250	3.28	100	0.86	710	2.91
1977	1160	7.41	270	3.43	130	1.03	710	2.61
1978	1230	7.40	290	3.51	140	0.93	720	2.53
1979	1270	7.52	310	3.57	110	0.68	730	2.38
1980	1280	7.07	330	3.51	160	0.90	740	2.29
1981	1310	7.24	360	3.55	160	0.84	730	2.02
1982	1330	6.87	370	3.43	200	0.99	1210	1.44
1983	1370	6.88	370	3.25	260	1.19	1160	1.28
1984	1400	6.70	390	3.19	280	1.23	1280	1.08

Estimates for Czechoslovakia and the GDR were made by multiplying the average share of military R&D in total R&D in the Western countries by total R&D expenditures in Eastern Europe.[39] Since the Polish figures appeared to cover R&D financed through the state budget only, a similar percentage for the FRG was employed. A substantial share of Polish R&D is financed by enterprises, so multiplying

[39]See App. A for details.

R&D expenditures financed by the state budget times the share of the military in *total* West German R&D would introduce a downward bias into the estimates. Because it has such a small arms industry, estimates for Hungary were made by multiplying estimates of Hungarian domestic procurement (Table 5) times military R&D as a percentage of procurement in the FRG. The other methods led to estimates that seemed implausible considering the size of Hungarian arms industries.

The resulting estimates seem plausible as shown by their size relative to the reported military budgets (Table 9). Military R&D as a percentage of total military spending in Sweden and the FRG averaged 6.5 and 3.0 percent, respectively between 1981 and 1984.[40] These estimates fall in that range. They also appear reasonable when compared with estimates of maximum feasible military R&D expenditures given in App. A. The estimates may suffer from an upward bias; Czechoslovakia, which receives many of its designs from the Soviet Union, may not devote as high a percentage of total R&D to the military as Sweden. The GDR, with its small arms industry, may also spend less on military R&D than implied by these figures.

Payments for the Support of Soviet Troops Based in the NSWP

Soviet troops are stationed in all four countries. The GDR has 20 Soviet divisions (nine tank, ten motorized, one artillery); Czechoslovakia has five (two tank); Hungary four (two tank); and Poland two, of which both are tank divisions.[41] The basing agreements for the GDR, Hungary, and Poland, which provide the legal basis for stationing, are not explicit concerning who is to pay for what and at what rate. The agreements stipulate that Soviet forces "will use barracks, exercise grounds, artillery ranges, buildings, equipment, means of transport, electrical power, and public and commercial services and that the rates of pay will be determined in a separate agreement."[42]

The Czech stationing agreement, signed in October 1968, provides more information. It stipulates that the Soviet Union will cover maintenance costs, but Czechoslovakia will provide barracks, housing, services, warehouses, airfields, and other services. Soviet trade establishments are to purchase goods and services from their Czech counterparts for sale to Soviet troops at state retail prices minus the wholesale discount. The Soviets pay in transferable rubles converted into koruna

[40]SIPRI, 1984, pp. 288–289.

[41]*The Military Balance*, 1984–85.

[42]Polish Status of Forces Agreement with the Soviet Union.

at a ratio determined by the ratio of domestic Czech prices to foreign trade prices.[43] None of this evidence indicates that the East Europeans cover any of the operational costs of the Soviet troops located in their countries. However, in order to assess that possibility, I have estimated these costs in local currencies for the four countries.[44]

Country	Subsistence Costs of Soviet Forces as a Percent of Reported Defense Budget (Average 1966–1984)
Czechoslovakia	2.5[a]
The GDR	9.3
Hungary	4.4
Poland	.7

[a]Since 1969.

The figure for the GDR is so large that if they supported Soviet troops, surely some East Germans, in emigration or even at home, would have made public mention of it. I have no knowledge of their having done so. The costs to Hungary of providing for Soviet troops are high enough that one would also expect some mention to have been made in public or private if they were covering them. If Czechoslovakia and Poland are defraying the costs of providing food and clothing to Soviet troops, the costs are small enough relative to their military budgets that it would be difficult to differentiate these costs from the costs of providing for their own troops.

The Czech Agreement and a statement by Khruschev in his memoirs that Soviet troops cost twice as much to station in Eastern Europe as in the Soviet Union[45] indicate that the Soviets probably pay most of the variable costs of stationing their men in Eastern Europe. The Soviets probably provide their own ammunition, spares, and equipment, because much of it differs from that used in Eastern Europe. Because so much of military supply networks are internal to the military, it is hard to imagine how the Soviets and East Europeans could devise a mutually acceptable accounting system to cover the costs of ammunition, spares, and equipment. Soviet wages are paid in rubles, so these are most probably paid by the Soviets. The Czech agreement indicates that the subsistence costs of Soviet soldiers also are covered

[43]Czech Status of Forces Agreement with the Soviet Union.

[44]See App. A for an explanation of how the estimates were made.

[45]Khruschev, 1974, p. 221.

by the Soviet Union. The only cost that appears to be potentially covered by the East Europeans is the cost of constructing military installations used by the Soviets, but the Soviets may even compensate them for these costs as well.

III. ARE THE REPORTED MILITARY BUDGETS RELIABLE?

EVIDENCE FROM EMIGRES

Western scholars concur that the Soviet military budget excludes a large share of Soviet military spending.[1] The size of the budget is too small to support actual levels of Soviet military activity. During the 1970s, a time when Soviet military procurement and the number of men under arms were increasing, the reported budget declined. Military expenditures are believed to be hidden in several other budgetary categories. For example, Nimitz argues that expenditures on military research and development have been covered under budgetary allocations for science.[2]

Checinski (1974) and Loebel have argued that actual East European military expenditures are also much higher than those reported in the defense budgets. Loebel, who was a department head of the Czech National Bank located in Bratislava, set up a group to trace military expenditures during the Prague Spring. The group concluded that resource flows to the military were three times those reported in the national budget. Loebel is reported to have said that the unreported expenses of the military were covered by price subsidies to arms manufacturers. The subsidies covered losses that were planned by the central authorities to reduce military budget figures.

Loebel's study presents a problem. Price subsidies on domestically purchased armaments should be included in the defense budget, but price subsidies on arms exports, a major item for Czechoslovakia, should not. If the subsidies were lumped together, the conclusion that actual defense expenditures exceeded reported expenditures by three times is exaggerated. Loebel's figures are also puzzling because procurement would account for about 80 percent of total military spending according to his figures. This ratio is very high.

Checinksi (1974) also argues that armaments production has been subsidized in Poland, thereby disguising the true costs of the military. One subsidy stems from the priority given military production. Military goods producers receive priority in obtaining labor, capital, and investment goods. Since military goods producers receive quality and delivery preferences, buyers of civilians goods provide the military with

[1]Becker, 1964, p. vi; SIPRI, 1984, p. 91.

[2]Nimitz, 1963.

an implicit subsidy because of higher prices for poorer quality goods or longer queuing times.

Checinski also claims that military production receives a hidden subsidy because indirect costs in Poland have been allocated by labor inputs.[3] He argues that in plants producing both military and civilian goods, military production is more capital-intensive, because the machinery is designed for these products; production of civilian goods on these machines uses relatively more labor inputs. Consequently, indirect costs fall disproportionately on the civilian goods. Checinski cites a study of seven Polish armaments producers showing that a reallocation of indirect costs would have raised military equipment prices by up to 200 percent.

Direct subsidies were also given to military producers if they failed to cover their costs. Checinski states that these losses accrued if the Ministry of Defense found it could not purchase the desired quantities of military goods from its budget. The Ministry then forced suppliers to lower prices to the point where the desired level of purchases could be financed. Losses also occurred if the Soviet foreign trading price converted into the domestic currency failed to cover production costs. The government then stepped in with a subsidy. Finally, military goods production received beneficial tax treatment because no turnover tax was paid on these products. This was also true of Hungary and, probably, Czechoslovakia.[4]

The evidence Checinski cites to support his arguments is somewhat mixed. For example, he notes that in 1958 a circular was sent to all Polish armaments factories *forbidding* them from allocating indirect costs from military to civilian production, indicating that this type of subsidization was not official policy.[5] He notes that because of accounting systems, factory managers found it impossible to disaggregate costs, implying that the degree of indirect subsidization is difficult if not impossible to measure. The argument that civilian goods have a higher labor content than capital goods in armaments plants is also open to question. Priority production for hard currency exports, for example, is more labor-intensive than lower priority production in Poland. Consequently, civilian goods production is unlikely to be much more labor-intensive than high priority military goods production in these plants.

Checinski's argument concerning subsidization in military arms trade is also inconclusive concerning the magnitude of these subsidies. His data and arguments indicate that cost-plus pricing is prevalent in

[3]Checinski, 1974, pp. 17–18.

[4]Marer and Pall, 1971, p. 12; Alton et al., 1968, p. 105.

[5]Checinski, 1974, p. 20.

intra-CMEA arms trade. At one point he argues that the Soviets squeeze East European defense manufacturers because trading prices for weapons are set on the basis of Soviet costs, which because of longer production runs are lower than costs of East European manufacturers. At another point, he accuses the Soviets of extracting monopoly profits on exports of many systems. Cost-plus pricing of Soviet imports in one case and monopoly pricing of Soviet exports in another are not inconsistent policies; but one would think the Soviets must pay some price, political or economic, to induce the East Europeans to purchase the arms in the first place, if East European leaders prefer not to spend on the military, which Checinski also argues.

In short, Checinski makes a convincing argument that arms production in Poland has a higher priority than civilian production, thereby imposing costs on civilian production that are not paid for from the military budget. He also notes that in some instances military producers receive direct subsidies from the government to cover operating costs. Presumably, these subsidies are not paid by the Ministry of Defense. However, he fails to provide an indication of the magnitude of these subsidies; the evidence cited does not indicate that they were large. He also fails to show that arms producers receive more beneficial treatment in terms of investments than *producers of civilian* machinery.

CONSISTENCY WITH BUILDING BLOCK ESTIMATES

Clements has constructed military expenditures series for the East Europeans using the building block method.[6] All the physical elements of the NSWP armed forces are identified and listed. These quantities are then multiplied by domestic prices or U.S. prices converted at purchasing power parity exchange rates and summed to estimate total costs in domestic currencies, a measure of *burden*.

Clements's estimates for Czechoslovakia, Hungary, Poland, and Romania average only 15 percent above the reported budgets, a difference he attributes to possible differences in coverage between the reported budgets and his estimates.[7] He found the reported East

[6]Clements, 1985, p. 463.

[7]For example, as noted by Alton (1980), some military personnel costs are absorbed by ministries other than the Ministry of Defense. Clement's estimates may also differ from the budgets reported by the East Europeans because his prices were estimated in dollars and then converted to East European currencies via purchasing power parity exchange rates. The dollar price estimates or the purchasing power exchange rates may have been inaccurate. However, the East European budgets may understate actual expenditures.

German budget exceeded his estimates by wide margins. Clements notes the difference may be due to payments for the support of the Group of Soviet Forces-Germany.[8]

Clements concludes that the reported military budgets are useful for measuring nominal military spending trends. Both the magnitude and rates of increase of the reported budgets are roughly consistent with his building block estimates. He also notes that steady growth and the absence of abrupt changes in the size of the Polish and Czech budgets indicate that coverage has probably remained the same since the 1940s when detailed, inclusive budgets were published. This is in sharp contrast with the reported Soviet budget, which appears to have covered less and less of actual expenditures since the end of World War II. In short, Clements provides strong evidence that the reported budgets include the bulk of NSWP military spending.

ARE MILITARY EXPENDITURES HIDDEN IN THE BUDGET?

It is possible that the military budgets are deliberately underreported, with part of these expenditures hidden elsewhere in the national statistics. Because the East Europeans, like the Soviets, use the *khozraschet* system,[9] these expenditures must sooner or later crop up in the national budget, either as a subsidy to an enterprise that is shouldering part of the burden by producing military goods at a loss or as an allocation within a nondefense category. Consequently, it should be possible to spot military spending in other components of the budget, if it is hidden there.

Unfortunately, the East European budgets are often short of detail and the extent of reporting of the national budgets varies across country and over time. Of the four countries, Poland publishes the most detailed budgetary breakdowns, decomposing expenditures by ministry as well as expenditure category. The other three countries give more detail than the Soviet Union; and, in contrast to the Soviet situation, itemized expenditures sum to total expenditures for all countries except the GDR. Nonetheless, the budgets leave many questions unanswered.

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[8]As noted above, available evidence indicates that it is unlikely the East Europeans cover more than the cost of building military facilities and bases.

[9]*Khozraschet* means the enterprise is an independent accounting unit and is expected to produce an operating profit.

Unitemized Categories in the Total Budget

Itemized categories in the Soviet national budget sum to less than the reported total budget. The difference between these two figures is believed to contain some military spending.[10] The absence of such a residual eliminates this source of financing military expenditures for three of the four countries. In the case of the GDR this unspecified residual exists. It averaged 6.8 percent of the total budget between 1979 and 1985 and was fairly constant during this period. It is unclear what this residual is spent on. Part may be devoted to foreign trade subsidies, but these could also be located in the category of government expenditures on industry. The increases recorded in the latter category over the past five years are more consistent with the decline in the profitability of GDR exports and the concomitant need for the state to subsidize exports.[11] This residual could also be used to pay for Soviet forces stationed in East Germany, subsidize industrial production or investment, cover some other expenses, or go toward military spending. If the last is the case this category could provide an increment of over 100 percent to the military budget.[12]

Because the other countries have no unspecified residual in which to hide them, unreported military expenditures would have to be hidden in other budgetary categories. Some candidates are examined below.

Enterprise Subsidies

Spending on the procurement of military durables could be hidden within allocations for the subsidization of enterprises. In all four countries, these allocations are very large, sometimes running over 50 percent of the budget and close to a fourth of NMP. A great deal could be concealed in sums of this size. Although some of these subsidies are identified, especially those on such consumer products as food, a large share is unidentified.

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[10]CIA, 1978, pp. 12-13.

[11]Utilized national income (UNI) in the GDR has grown more slowly than NMP in recent years because of the export drive launched to prevent default on hard currency debts and to balance trade with the Soviet Union. A comparison of GDR trade balances recorded in the CMEA statistical yearbooks with differentials in the rate of growth of UNI and NMP indicates that the profitability of exports has fallen; the marginal domestic cost of an additional unit of net exports has risen. East German economists have also admitted that the profitability of exports has declined. Enterprises must have been compensated for loss-making exports by subsidies.

[12]Between 1981 and 1985 the residual ranged from 128 to 96 percent of the recorded defense budgets and averaged 113 percent. The residual declined over time as a percent of the recorded military budgets.

In Czechoslovakia budgetary payments to enterprises excluding investment grants have averaged 21.6 percent of the total budget since 1971. These operating subsidies run two to three times the reported total for military spending. These payments are disaggregated according to type of subsidy: consumer price subsidies, planned coverage of losses, for technical development, etc. Unfortunately, it is unclear which of these categories could contain subsidies for military production.

The GDR designates about one-quarter of its budget toward subsidization of enterprises and investments. Part of these expenditures can be disaggregated by comparing government expenditures recorded in the statistical yearbook with the initial budgets. Even after disaggregation, over half of these expenditures go unexplained; this remainder generally runs more than twice the size of the reported military budget.

The Hungarians have allocated about 30 percent of their budgets to subsidies. They provide no breakdown. Military production is so small in Hungary that it is hard to believe that any significant part of these subsidies funds military procurement from domestic sources. Funds for the subsidization of foreign trade are probably large enough to subsidize arms imports.

Poland provides the most detailed breakdown of these expenditures. For Poland the evidence of the potential for subsidization of military production is mixed. In many years subsidies to the Ministry of Metallurgy and Engineering are too small to encompass sizeable military subsidies.[13] Since 1982 this is the only ministry that could produce military goods. Before the 1982 reorganization the Ministry of Heavy Industry may also have produced military equipment, but subsidies to it were even smaller than to the Ministry of Engineering. The only areas where such subsidies are likely to be hidden are in subsidies to the Ministry of Foreign Trade and an unspecified residual. The Ministry of Foreign Trade could subsidize imports of military equipment, as suggested by Checinski (1974). It could also subsidize military exports, but, if that is the case, these subsidies are given for political or other reasons. They should not be included under military expenditures because the benefit accrues to the foreign buyer, not the domestic military.

The unspecified residual in subsidies could include subsidies to enterprises producing military goods. This residual has run from 10 to

[13]Before 1977 economic subsidies to this ministry ran less than 4 percent of the military budgets; since 1976 they have run from 15–26 percent. Information provided by *Polityka*, a Polish weekly, on the finances of the 500 largest enterprises in Poland indicates that a large part of these subsidies go to firms that do not manufacture military equipment.

20 percent of monies allocated for "Financing enterprises and other economic units" and about 50 to 100 percent of the reported military budgets. However, the breakdown by ministry uses the category "Expenditures on economic activity," which may be narrower than the broad budgetary category, "Financing of Enterprises and Other Economic Units," so the unspecified residual could possibly be accounted for by other items.[14]

Military Goods Pricing Policies

To this point I have examined where military procurement subsidies could be hidden; the question of whether military procurement is subsidized at all has yet to be answered. Because factor prices in Eastern Europe differ markedly from those on the world market, one can argue that the whole economic system is characterized by cross-subsidies from one sector to another. Such a view renders the question of subsidization of military procurement moot. Actual subsidization could be computed only by constructing a general equilibrium model of these economies and comparing military equipment prices generated by the model with those actually employed. A more tractable approach is to compare the level of subsidization on civilian and military goods produced by the same industries. Because a large part of military procurement consists of machinery, I concentrate on this sector below.

Machinery prices in the NSWP economies tend to be set on a cost-plus basis. Profit markups are often set by the center; they may vary from industry to industry or by type of customer. Manufactures sold for personal consumption usually carry a sales tax called a turnover tax; machinery sold for investment does not.

L. W. International compiled six reports on the financial systems of Czechoslovakia, Hungary, and Poland in the late 1960s and early 1970s.[15] Much of the overall financial structure in these countries remains the same today. According to these studies, pricing schemes for military equipment differ from those for machinery in all three countries. In Hungary and Poland special unpublished regulations cover military equipment pricing. In Hungary military orders, like export orders to CMEA countries, are obligatory for enterprises; even if

[14]Part of these expenditures could be absorbed by governmental offices that may be omitted in the published budget; the numbering of ministries in the budget often skips a number or two, although I could detect no omissions.

[15]Alton et al., 1968; Czirjak and Pall, 1968; Feiwel and Wynnczuk, 1971; Holesovsky and Wittich, 1968; Holesovsky, Wynnyczuk, and Pusch, 1971; Marer and Pall, 1971.

an enterprise loses money on an order, the order has to be filled.[16] In Poland all enterprises under the Ministries of Interior and Defense are exempt from capital charges, and investments are financed by the budget.[17] In other words, these enterprises receive more favorable tax and investment treatment than the norm. However, the size, number, and output mix of such enterprises is unknown; most manufacturers of heavy military equipment probably fall under the jurisdiction of an industrial ministry, rather than the Ministry of Defense.

This evidence indicates that pricing systems in Hungary and Poland, and probably Czechoslovakia and the GDR as well, are designed to keep military procurement prices lower than they otherwise would be. However, the evidence that direct operating subsidies to producers of military equipment are large or the norm is more mixed. In Poland prices of military equipment are set similarly to those for special machinery, on a cost-plus basis (including depreciation) and a maximum profit markup of 8 percent.[18] Checinski's discussion of arms trade prices also suggests that cost-plus pricing is the norm for military equipment, although cost components, like capital charges, may be omitted.

Centrally Funded Investments

The Hungarians note that central stockpiles are funded from the budgetary category for centrally funded investments.[19] This category may also cover strategic stockpiles. If that is the case, these expenditures constitute a direct subsidy from the budget to the Ministry of Defense. Since changes in strategic stockpiles are recorded in the accumulation category, this area of the budget may cover increases in strategic stockpiles for the other countries also. It is certainly large enough, running 10 percent of the total budgets of Czechoslovakia and the GDR as well as Hungary. In the case of Czechoslovakia the bulk of these investment subsidies are disaggregated further, by type of economic organization: budgetary organizations, cooperatives, and enterprises. The first named accounts for roughly two-thirds of investment subsidies.

This category probably also contains some expenditures on investments in armaments industries. Work by L. W. International indicates that military producers do receive favorable investment treatment;

[16]Marer and Pall, 1971.

[17]Feiwel and Wynnyczuk, 1971, pp. xiii, 181.

[18]Feiwel and Wynnyczuk, 1971, pp. xiii, 181.

[19]*Magyar Koezloeny*, December 21, 1981, p. 1280.

investment in factories owned by the Polish Ministry of Defense is funded entirely from the national budget.[20] These expenditures should not be considered a direct subsidy to the Ministry of Defense unless the prices of the resulting products fail to cover amortization charges, however. As noted above, price formation rules for military equipment manufacturers appear to include amortization charges so these investments grants can probably not be construed as a direct subsidy. Of course, if military costs were recalculated using shadow prices on a factor cost basis, the capital costs of military production might be higher because investment in centrally planned economies is usually financed through budgetary grants or at artificially low interest rates; capital charges to enterprises tend to be lower than the shadow price of capital. But these features do not constitute a direct subsidy to producers of military goods.

In Czechoslovakia military construction costs may be covered in the centrally funded investment category.[21] Unfortunately, data needed to measure the value of such subsidies are not available.

Other Budgetary Categories

George Stahler has found further evidence supporting Loebel's argument that a large part of Czechoslovakia's military expenditures is financed outside the reported military budget. In the 1968 Czechoslovakia statistical yearbook, the 1967 budget is disaggregated by government office, as well as category, which is a much finer breakdown than provided in other years. In this yearbook the reported military budget falls under the government departmental heading, "Other Headings," which is financed from the category, "Financial Expenditures." Small portions of the expenditures of several other government departments are financed from this category, but only one entitled "General Administrative Expenditures" is entirely financed from it.

Expenditures in this section ran 128 percent of the reported military budget. In the 1969 yearbook this category was eliminated and various components scattered among other categories, but most were lodged in under "Services and Expenditures of a Non-Productive Character."[22] This category rose from 2,314 million crowns in 1967 to 29,511 million crowns in 1968. "Financial Expenditures" were 28,992 million crowns in 1967. This category covers net subsidies for foreign trade and may cover general government administration costs but may also hide

[20]Czirjak and Pall, 1968; Holesovsky and Wittich, 1968.

[21]Alton et al., 1968.

[22]*Statisticka rocenka CSSR 1969*, p. 165.

additional military expenditures. It may be the category Loebel refers to in his work. If so, this category provided a potential source for military spending that averaged 142 percent of the reported military spending between 1968 and 1983.

The Science Budget

The military research and development expenditures calculated in Sec. II were based on the assumption that these expenditures are funded in the budgetary category for science rather than under military spending. Alton et al. (1968) and Marer and Pall (1971) argue forcefully that this is the case for Czechoslovakia and Hungary. This is consistent with conventional Western wisdom concerning the funding of Soviet military research and development.[23] The Czechs publish an entry in their national budget entitled "Grants for the Needs of Military Nature, Including Research and Development Programs," which are given to the governments of both the Czech and the Slovak republics by the federal government. It is not clear whether these grants are subsequently listed by the republics under their own expenditures on defense (the sums are less than the corresponding expenditures by the republics) or whether they involve military spending above and beyond that reported for defense in the national budget. These grants ran about 6 percent of the military budget in 1979 and 1982[24] and are about the same size as the estimates for military R&D given in Table 9.

Some military R&D could be financed by the enterprises. If this is the case, the costs of this research would eventually have to be paid by the government either in purchase prices of military equipment incorporating this technology or through enterprise subsidies. Some expenditures on military R&D are likely to fall into this category.

Social Expenditures

Alton et al. (1980) have shown that certain military expenditures on personnel are included in budgetary categories other than defense spending. Transportation of soldiers to their first tour of duty and during leave is at least partly paid for by the national railroads or bus services, which in turn usually receive government subsidies for operating costs.[25] Pre-entry physicals are paid for by the national health service. Enterprises pick up the wage bill for reservists on maneuvers,

[23]Nimitz, 1963.

[24]Alton et al., 1980, p. 13; *Sbirka Zakonu CSSR*, #3, 1982, pp. 700–711.

[25]Military personnel receive concessionary prices on railroad and bus tickets in these countries.

and the national pension and welfare offices pay the pensions of retired military officers, plus disability insurance and child support allowances for all military personnel. Military education may also be included in the education budget, although Polish defense budgets from the late 1940s include an item for military academies.[26] The sum of these costs is nonnegligible, running 12–17 percent of the reported budgets, but about half of these extra costs accrue from military pensions paid by the state.[27]

These costs are not multiples of the reported budgets, nor do they indicate that the military budgets are purposefully understated for propaganda reasons. Pension and child support benefits for all occupations, including the military, are handled by a central administration in these countries. Concessionary fares on public transportation are also normal parts of the system. Because personnel costs covered outside the military budget are covered by the same institutions that provide similar services to citizens in other occupations, these expenditures do not indicate that the East European governments try to deliberately understate their military expenditures by allocating personnel costs to other budgetary categories. They do show that the reported budgets fail to cover the entire cost of the military.

VARIATION AND THE MAGNITUDE OF THE BUDGETS

Other evidence indicates that the East European military budgets cannot be as easily dismissed as the Soviet Union's. Of the four countries under discussion, all of the budgets have steadily increased in nominal terms over the past two decades, in contrast to the budget reported by the Soviet Union (Table 1).

The size of the budgets also seems reasonable as a share of net material product, considering the size and composition of the East European forces (Table 10). They run 2–6 percent of UNI, ratios that would be somewhat lower if gross domestic product (GDP) was used as the divisor. Although UNI is less than GDP, the share differences in the case of Hungary are only about 0.2–0.6 percentage points, indicating that the reported military budgets as a share of total output are roughly on a par with those of many countries in Western Europe.

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[26]Clements, 1985, p. 457.

[27]Alton et al., 1980.

Table 10

MILITARY BUDGETS AS A PERCENTAGE OF UTILIZED NATIONAL INCOME

	Czechoslovakia	Poland	Hungary		GDR[a]	
Year	(UNI)	(UNI)	(UNI)	(GDP)	(UNI)	(NMP)
1960	5.55	3.98	1.98	1.80	1.25	1.28
1961	5.61	4.18	2.10	1.87	1.25	1.26
1962	6.32	4.32	2.88	2.59	3.26	3.30
1963	6.84	4.53	3.57	3.26	3.37	3.30
1964	6.21	4.52	3.20	2.92	3.35	3.27
1965	5.97	4.41	3.06	2.77	3.40	3.35
1966	5.70	4.45	2.61	2.25	3.29	3.30
1967	5.51	4.43	2.43	2.20	3.54	3.53
1968	5.22	4.63	2.78	2.29	4.61	4.48
1969	5.00	4.88	3.03	2.45	4.64	4.64
1970	4.96	4.88	3.48	2.96	4.73	4.81
1971	5.09	4.48	3.07	2.73	4.84	4.85
1972	5.06	4.15	2.93	2.40	4.76	4.77
1973	4.96	3.80	2.77	2.19	4.75	4.81
1974	4.65	3.57	2.66	2.32	4.62	4.65
1975	4.83	3.45	2.75	2.45	4.79	4.71
1976	4.81	3.20	2.57	2.19	4.78	4.84
1977	4.83	3.34	2.52	2.15	4.73	4.77
1978	4.76	3.22	2.63	2.38	4.91	4.83
1979	4.70	3.41	2.80	2.38	5.06	4.86
1980	4.79	3.49	2.96	2.45	5.21	5.03
1981	5.06	3.63	2.96	2.44	5.54	5.16
1982	5.18	3.97	2.93	2.38	6.08	5.35
1983	5.21	3.45	3.04	2.44	6.44	5.42
1984		3.71	2.94	2.32	6.72	5.49

SOURCE: Statistical handbooks of Czechoslovakia, Poland, Hungary, and the German Democratic Republic.

[a]Utilized national income, the goods consumed within the country, was employed rather than NMP, because it is a measure of the resources domestically available to the national governments. The Hungarian GDP measure provided a point of reference for Western measures. The GDR does not publish values for UNI or NMP in current prices, so these values were estimated. See App. C for details.

CONSISTENCY CHECKS WITH OTHER STATISTICAL DATA

Other data also appear consistent with the reported military budgets. Table 11 shows the personnel costs estimated in Sec. II as a percentage of the reported budget. These costs are the "hardest" of the estimates; they are based on cost of living and wage data and Western

estimates of military forces. They run from about one-fifth to one-third of the reported budgets.

The reconstructed military budgets recorded in Tables 3–6 provide another check for the recorded budgets. My estimates averaged 106.3 percent of the reported Czech budgets, 104.0 percent of the Hungarian budgets, and 107.2 percent of the Polish budgets. Estimates of East German operations and maintenance expenditures plus personnel costs average 56.1 percent of reported expenditures.

I believe that the close fit between estimated and reported budgets provides strong support for the proposition that the reported budgets record the bulk of actual military expenditures on personnel, operations and maintenance, and procurement. Part of the discrepancy between the estimated and reported budgets can reasonably be ascribed

Table 11

PERSONNEL COSTS AS A PERCENTAGE OF REPORTED MILITARY BUDGETS
(Percent)

Year	Czechoslovakia	The GDR	Hungary	Poland
1965	30.9	41.0	39.5	32.2
1966	27.3	42.9	46.8	28.8
1967	25.6	39.4	41.8	30.7
1968	26.5	30.6	37.9	28.1
1969	27.4	27.2	32.2	26.3
1970	19.5	24.6	26.2	21.9
1971	20.8	22.7	28.8	25.6
1972	20.6	22.1	32.2	26.8
1973	20.6	23.1	32.4	28.6
1974	21.9	24.6	30.1	29.6
1975	23.4	23.8	29.5	33.2
1976	20.3	24.9	27.1	32.9
1977	21.0	25.1	32.1	28.9
1978	21.8	24.2	25.2	32.5
1979	22.1	23.9	27.4	32.5
1980	21.1	22.8	22.9	33.1
1981	21.3	22.4	25.0	33.3
1982	21.0	21.2	27.1	24.2
1983	22.2	20.7	24.5	29.3
1984	22.1	20.2	NA	25.2
Average	22.9	28.0	31.0	29.2
Standard Deviation	3.0	7.6	6.3	3.3

SOURCE: See App. A for details.

to errors in estimation. The use of residuals tends to lead toward upwardly biased estimates, because this method includes all unidentified components in a category, including nonmilitary expenditures. However, my estimates omit administrative costs and, in the case of Czechoslovakia and Hungary, military construction costs as well.

CONCLUSIONS

Although the evidence is not all in, a reasonable working hypothesis is that, with the possible exception of Czechoslovakia, the reported defense budgets contain the major components of military spending: personnel costs, procurement, operations and maintenance, and construction. My estimates strongly suggest that actual military expenditures in these countries are not a multiple of the reported budgets, as appears to be the case in the Soviet Union.

The reported budgets do appear to omit military research and development expenditures, some personnel expenditures identified by Alton et al. (1980), covered by ministries other than the Ministry of Defense, most notably military pensions and family support costs, and some direct subsidies for military producers. In the case of Czechoslovakia military construction costs also appear to be covered under the investment, not the military budget.[28] Estimates of these apparently unreported costs run 12–17 percent of the reported budgets for personnel costs and 1–7.5 percent for R&D.[29] I have been unable to locate or quantify the extent of direct subsidies to military producers. Close perusal of the Polish budgets failed to generate evidence that they are more than a few percent of the reported budgets. Loebel is reported to have said that they have been multiples of the Czech military budgets, and Stahler has identified a budgetary category that could cover these expenditures.[30]

Although all these measures reduce the size of the reported military budget, some of them were probably not adopted for purposes of deception. In particular, the provision of military pensions and family support through the social security administrations of these countries appears to stem from the universal nature of pensions and family support grants in centrally planned economies, rather than a conscious decision to hide military spending.

One remaining mystery is the GDR military budget. Because of the paucity of data, most notably the lack of input-output tables, no

[28]Alton et al., 1968.

[29]Alton et al., 1980, Table 9.

[30]Personal communication.

estimates of procurement of military durables could be constructed for this country. Although the estimates for personnel and for operations and maintenance costs were of roughly the same size as those for the other three countries, the extent to which the rest of the budget goes to procurement remains a mystery. Moreover, in contrast to the other three countries, Clements (1985) finds the reported GDR budget to be substantially larger than his building block estimates and notes that the GDR could contribute to the support of Soviet troops on its territory. I could find no evidence of such contributions. A more precise breakdown of how the East Germans are spending their rapidly rising military appropriations remains an interesting topic for further research.

IV. DETERMINANTS OF MILITARY SPENDING

The processes by which Western governments decide how much to budget for various expenditures, including the military, are well-documented, if not easily explained.[1] Similar studies of the processes in Eastern Europe are not available, aside from the reports of a few emigrees.[2] Nonetheless the East European governments face incentives for and constraints on military spending similar to those faced by governments in other regions. The threat of invasion, the wish to threaten, fear of revolution, the need to placate generals (often an important interest group), and pressure from a dominating power all provide incentives to spend. Competing demands from other claimants on output limit expenditures. Economic output plus what the country can beg, borrow, or steal from its neighbors limit what can be spent.

The relative importance of these variables and the process by which decisions are made on military spending levels have been subject to dispute. Some argue that military spending levels are set in Moscow and the East European leaderships merely incorporate these numbers into their plans. The East European leaders claim decisions on military spending decisions are taken independently, after collegial discussions with other members of the Pact, in response to threatened NATO aggression.

A somewhat different model that may be stretched to encompass facets of both these views has emerged from emigre accounts. The East European Politburos or subcommittees thereof decide on military spending levels, after weighing the merits of other potential uses of resources against pressures from the Soviets and their own military and their perceptions of an external threat. Changes in expenditures, as in almost all bureaucracies, are made at the margin, so this is where the debate is concentrated.

Although we lack detailed knowledge of how military expenditures are determined in Eastern Europe and the relative importance of various pressures in determining final levels, the expenditures recorded by these countries provide a way to test this model or at least the relative weights of some of these incentives and constraints. Below several hypotheses, not all mutually exclusive, are tested using the reported East European military budgets to see which best explain the patterns of military spending in these four countries.

[1]Schick, 1980.

[2]Checinski, 1974.

SOVIET PRESSURE

One traditional Western explanation for East European military expenditures is that the Soviet Union has coerced the smaller Bloc states against their national interests into joining a potentially aggressive pact with an offensive force posture directed against a defensive NATO alliance. The citizens of these countries see little advantage in this arrangement, because they do not perceive a threat from the West, but from the East.[3] According to this interpretation, if the possibility of developing a military force strong enough to provide a credible deterrent to the Soviet Union and other bloc members is ruled out, the main reason for military expenditures is to placate the Soviet leadership by responding to their demands for higher expenditures.

Checinski cites several instances when the Soviets have applied pressure on the East European governments to increase military spending.[4] Ceausescu openly complained of Soviet pressure after the November 22–23, 1978, meeting of the Warsaw Pact Political Consultative Committee, the highest political body in the Warsaw Pact, at which the Soviets pressed the NSWP to increase expenditures in response to the May 1978 NATO agreement to 3 percent annual real increments in military spending. Other countries, most notably Hungary and Poland, also reportedly complained privately of Soviet pressure.[5]

The reasons why the Soviets would want Eastern Europe to spend more on the military are not completely clear. At a time of slower economic growth the Soviet leadership would naturally like to offset part of the cost of maintaining its present force posture in Eastern Europe, if present force levels could be maintained. Unfortunately for the Soviets, the East Europeans have not proved the most reliable allies. Consequently, the Soviets may have some reservations about substituting East European expenditures for their own.

Soviet treatment of the East Europeans reflects these reservations. After the 1956 uprising in Hungary, the Hungarian army was disbanded, even though it did not formally oppose the Soviet invasion. Even though reconstituted and finally reintegrated into the Pact by 1962, it has never regained its former size.[6] Although the Czech army

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[3]In fact, since the end of World War II the only real threat of invasion they have faced has come from the other members of the Bloc, most notably the Soviet Union, as shown by the experiences of Czechoslovakia, Hungary, and Poland.

[4]Checinski, 1974, p. 24.

[5]Simon, 1985, p. 126.

[6]Mackintosh, 1969, p. 4.

was not dissolved, the officer corps was purged after the 1968 Soviet invasion and the size of the army reduced.[7]

Soviet supply of advanced weapon systems may also betray doubts concerning the reliability of the East Europeans. The Syrians and Indians have been able to purchase more advanced Soviet aircraft earlier than the East Europeans.[8] The East Europeans have suffered long delays in purchasing more modern Soviet tanks.

This said, Soviet pressure to spend on the military has been well-documented. Assuming that some East European leaderships are less than enthusiastic about increasing expenditures, what instruments do the Soviets have at their disposal to press the East Europeans to increase their expenditures and have they been able to employ them successfully?

The Soviets do not appear to have been very successful in inducing the East Europeans to spend more on the military. Assuming that budget changes are a good reflection of total actual expenditure changes, the record of East European military expenditures after the 1978 Warsaw Pact agreement provides a test of the extent of Soviet influence on spending levels in Eastern Europe. The results, recorded in Table 12, indicate that, with the exception of the GDR, the East Europeans failed to accelerate the rate of increase in their expenditures levels. The figures for real spending (nominal spending deflated by the price index for nonconsumer goods and services) show average annual growth rates of 1 percent or less for all countries except the GDR, considerably lower than the NATO targets of 3 percent. In real terms these increases were less than half the rate of the previous seven-year period for all countries, again with the exception of the GDR.

In all four countries, increases did exceed 3 percent in nominal terms. However, inflation in Czechoslovakia and Hungary, not to mention Poland, accelerated in these years; so the nominal figures are a poor reflection of either increases in the burden of defense or of absolute increases in spending. Moreover, rates of inflation were so high that policymakers must have been well aware of them when they were drawing up budgets. These countries appear to have given consumption or debt service a higher priority than military spending despite Soviet pressure.

These results change somewhat when the decline in the rate of growth in UNI is factored in. Estimates of the parameters of a model of East European military spending decisionmaking (described in detail in App. D) indicate that after the 1978 meeting, Hungary as well as the GDR increased the level of military spending above and beyond levels

[7]*The Military Balance*, 1967, 1970.

[8]*The Military Balance*, various years.

Table 12

ANNUAL PERCENTAGE INCREASES IN REPORTED MILITARY BUDGETS[a]

	Czechoslovakia		GDR		Hungary		Poland	
Year	Nominal	Real	Nominal	Real	Nominal	Real	Nominal	Real
1972	5.2	5.3	3.3	3.9	0.4	-1.1	4.8	4.4
1973	5.2	5.1	5.7	7.0	-4.7	-6.4	7.1	5.3
1974	2.4	2.6	2.7	4.3	0.6	-2.3	9.6	6.3
1975	9.2	9.3	6.1	7.8	11.3	7.8	8.3	5.9
1976	3.2	3.0	6.4	8.2	11.8	1.1	8.0	-5.0
1977	-1.2	-5.9	3.4	5.1	-1.2	-5.5	12.3	-1.2
1978	3.4	3.2	5.0	6.9	8.0	5.9	3.8	0.1
1979	2.7	2.4	5.0	6.6	8.1	5.8	7.8	5.6
1980	7.1	5.1	8.4	9.6	9.3	-5.3	5.0	-1.8
1981	0.9	-3.8	7.9	8.9	7.7	1.3	12.6	-7.1
1982	6.3	-1.2	6.2	7.2	6.0	1.4	131.1	1.3
1983	2.9	3.2	5.8	6.8	8.4	2.6	8.2	-7.3
1984	4.0	-3.9	7.2	8.2	3.6	-0.6	30.8	15.2
1985			6.7				23.4	
Average 1972-78	3.9	3.2	4.6	6.2	6.4	2.2	7.7	2.3
Average 1979-present	4.0	0.3	6.8	7.9	7.2	0.9	31.3	1.0

[a]Increases in real expenditures were calculated by deflating nominal expenditures by the price index for nonconsumer goods and services for all countries but the GDR, where the consumer price index was used.

that would probably otherwise have been attained.[9] An alternative model (App. D) indicates some response by Czechoslovakia to Soviet pressure, but no Hungarian response. Post-1978 pressure appears to have had no discernible effect on Polish expenditures.

Answers to the question, What benefits or penalties can the Soviets promise for changes in military expenditures? are more speculative. One possibility is that the East Europeans agree to meet Soviet requests for military expenditures or agree not to question Soviet military doctrine in order to garner more room for maneuver in foreign or

[9]A dummy variable for the 1978 decision was inserted into an equation containing variables affecting the military spending decision. This dummy variable was positive and had p-values of 10 percent or less for Hungary and the GDR. Using a one-tail test, the hypothesis that post-1978 Soviet pressure had no effect on military spending levels could be rejected at the 5 percent level.

domestic policy. This theory assumes that the East Europeans can counter Soviet criticisms of specific policies by citing their contribution to the Pact military effort. Ross Johnson speculates that this is one reason the Polish military has never openly questioned Pact doctrine in their extensive writings.[10]

In a similar vein, Dale Herspring argues that East Germany has expanded its navy in recent years in order to satisfy Soviet pressure to increase military expenditures and relieve Soviet pressure for other policy changes, not because it is a particularly potent military force or because it will foster GDR security.[11] In fact, in the event of a NATO-Warsaw Pact conflict, Western air power would probably quickly destroy the East German navy.

Reisinger (1983) argues that the Soviets pressure the NSWP to increase military spending, primarily through economic leverage. He argues that Soviet economic leverage is determined by the benefits bestowed on the East Europeans; the greater the benefits, the higher the percentage of GNP the East Europeans are expected to spend on their militaries.

Reisinger tests his hypothesis by comparing the rank order of East European countries by military budgets as a percent of GNP with their rank order by the value of Soviet trade subsidies received, as computed by Marrese and Vanous (1981). He finds the two series are positively correlated; the null hypothesis that they are uncorrelated can be rejected in most cases at the 5 percent level of significance (Table 13).[12]

Table 13

THE RELATIONSHIP BETWEEN MILITARY SPENDING AND SOVIET SUBSIDIES

	1970	1971	1972	1973	1974	1975	1976	1977	1978
Reisinger's results									
Tau	.81	.73	.62	.75	.79	.79	.77	.81	.88
P-value	.014	.031	.064	.026	.017	.018	.023	.014	.006
My results									
Tau	.47	.47	.33	.20	.20	.33	.33	.33	.47
P-value	.189	.189	.348	.573	.573	.348	.348	.348	.189

[10]Private communication.

[11]Private communication.

[12]Reisinger, 1983, p. 152.

Reisinger's model appears to be misspecified. He correlates an absolute measure, the dollar value of the subsidy, with a relative indicator, military expenditures as a percent of GDP. The absolute measure seems unwarranted. If a subsidy is large as a percentage of national income, the leaders of a small country may value it more highly than the leaders of a larger country, even if the subsidy is smaller in absolute terms. The government of Fiji may well value a $10 million grant more highly than the government of India values $100 million.

I have rerun Reisinger's hypothesis test substituting the rank orders of the value of the subsidies as a percentage of GNP for the absolute values.[13] My results are markedly different. In no case can the null hypothesis that the two series are uncorrelated be rejected using a 10 percent level of significance. In most years there seems to be little correlation between the two series. In short, this test provides no support for the hypothesis that the East Europeans increase the share of output devoted to the military in exchange for trade subsidies from the Soviet Union.

TRADE AND MILITARY SPENDING

One possible explanation of the difficulty the Soviets appear to have had in inducing Czechoslovakia, Hungary, and Poland to increase military spending is a possible decline in Soviet economic leverage over these countries in the 1970s as they have expanded their trade with nonsocialist countries. Although the Soviet Union remains the predominant market for East European exports and their most important supplier of raw materials, expansion of trade with nonsocialist countries may have slightly weakened Soviet economic clout. In fact, one of the rationales for encouraging Western trade with Eastern Europe has been to weaken Soviet economic leverage over these countries.

If one assumes that the percentage of trade conducted with nonsocialist countries weakens Soviet economic leverage and that the East Europeans respond by limiting military spending to increase expenditures on more pressing needs, one would expect the percentage of UNI devoted to military spending to decline as the percentage of nonsocialist trade rises. To test this hypothesis I regressed the percentage of reported military spending in UNI in these four countries on the percentage of their trade conducted with nonsocialist countries.

[13]Trade subsidy ratios were calculated in constant prices with the same data sources Reisinger used.

The results of the test are mixed (Table 14). There is no evidence to show that an increase in the share of trade with nonsocialist countries would spill over into a decline in Soviet leverage leading to a diminished military effort in the case of the GDR or Hungary. A strong negative correlation exists between the percentage of UNI devoted to the military and the percentage of trade conducted with nonsocialist countries in the cases of Czechoslovakia and Poland, but further research is necessary to test whether this reflects the effects of conscious policies or merely spurious correlation.

Table 14

NONSOCIALIST TRADE AND MILITARY SPENDING IN EASTERN EUROPE
(T-statistics in parentheses)

Czechoslovakia			F = 6.63	N = 24
MILPER[a] =	8.79	−	.12 × TRADE[b]	
	(6.44)		(−2.576)	
Durbin-Watson statistic = .24				
GDR[c]			F = 39.87	N = 23
MILPER =	−.62	+	.18 × TRADE	
	(-.07)		(6.32)	
Durbin-Watson statistic = 1.00				
Hungary			F = 0.13	N = 25
MILPER =	2.68	+	.004 × TRADE	
	(6.58)		(0.36)	
Durbin-Watson statistic = .73				
Poland			F = 11.49	N = 25
MILPER =	6.07	−	.05 × TRADE	
	(9.87)		(−3.39)	
Durbin-Watson statistic = .56				

[a]MILPER = reported military budgets as a percent of UNI.

[b]TRADE = the percentage of nonsocialist trade in total trade.

[c]Military budget estimates for the GDR begin in 1962.

ECONOMIC WHEREWITHAL

The absolute amount that a country can spend on its military is physically limited to how much the country can produce or extract from other countries. The centrally planned economies of Eastern Europe are no different from other economies in this regard: Military output is limited by economic resources. As these resources expand, the country has in toto the capability to spend more on the military; if they contract, there is less, although the share of defense in total output can be increased to compensate.

Policymakers must still decide on whether to spend a portion of increased output on the military. In this case the question is whether military services are a *normal* good—whether policymakers wish to purchase more such services as income rises. If policymakers perceive increased spending as leading to greater security, one would expect military spending to rise as national income rises.

In general, East European leaders indicate that they have a low preference for increasing military spending. After the November 1978 Pact meeting calling for increased military expenditures, Nicolae Ceausescu returned to Romania and denounced Soviet efforts to get NSWP members to increase their military expenditures.[14] Hungarian and Polish officials also indicated they would not be able to increase spending greatly because of their economic problems.[15]

Subsequently, NSWP government officials have continued to comment on the burden of defense. After the renewal of the Warsaw Pact in 1985, Lajos Czinege, the Hungarian Minister of Defense, stated that Hungary would meet its obligations to the alliance only "in proportion to the capabilities of our national economy and our realistic possibilities."[16] Edward Honecker and Gustav Husak, the First Party Secretaries of the GDR and Czechoslovakian Communist parties, respectively, expressed indirect dissatisfaction with the decision to install short-range theater nuclear missiles in their countries, made under Soviet pressure. They orchestrated the publication of letters critical of the decision to be printed in the countries' tightly controlled newspapers.[17] Reportedly, part of the costs of the missiles were to be borne by these two countries.[18]

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[14]Reisinger, 1983, p. 143.

[15]Budapest Domestic Television Service, 19:25 Greenwich Mean Time as cited in FBIS, EE, 19 December 1978, p. F4; Bernard Marguerite, *Le Figaro*, 11 December 1978, p. 3.

[16]Radio Free Europe, RAD BR/143 20 December 1985.

[17]Ibid.

[18]Ibid.

The opportunity costs of military expenditures are a compelling reason why East European governments may prefer lower levels of military spending than those desired by the Soviets. The East Europeans have been much less successful than the Soviets in instilling support for the present systems through ideology. Consequently, they have based much of their political legitimacy on economic performance. Because central control of the economy is so strong, the Communist parties and their governments are held responsible and often take responsibility for consumer supplies and changes in living standards. Because military spending is a budget item, be it hidden or overt, the top Party leadership must be well aware of the opportunity costs of spending more on the military rather than on schools, infrastructure investments, or consumer goods subsidies. Because economic problems have often led to civil disturbances and, subsequently, regime changes in Eastern Europe, Party leaders may feel that spending on civilian subsidies increases their job security far more than a rise in military spending.

In order to test the hypothesis that changes in military spending depend on changes in national income as well as hypotheses concerning the importance of Soviet pressure, external threats, and domestic unrest, I have constructed and estimated a small model of military spending in Eastern Europe. In this model reported military spending in constant prices is assumed to be a linear function of utilized national income, marked shifts in Soviet and NATO policies toward Eastern Europe, and domestic unrest. Details of the model and variations are provided in App. D. The results of the regressions are presented in Table 15.

The results indicate that UNI has been the most important determinant of military spending in Eastern Europe. Both as a group and individually the primary force driving expenditures in these countries has been available resources. As noted above, Soviet pressure appears to have been an important factor for the GDR and Hungary only. The variables for a shift in NATO policies and domestic unrest were insignificant for all four countries.

The above model was designed to test various hypotheses concerning why spending levels change from year to year within each country. Another question of interest is why levels of effort vary over time and across countries. In this case a common measure of military effort is needed. Because it avoids the issue of differing levels of development and the problems of converting military expenditures into a common currency, I have used the percentage of military spending in utilized national income as a measure of effort in this model. Otherwise the regression equations are the same as in the first model, except for the

Table 15

FACTORS AFFECTING MILITARY SPENDING IN EASTERN EUROPE
(T-statistics in parentheses)

Czechoslovakia			F = 166.0			N = 22						
MILINR[a] =	33.9	+	.69 ×	UNIR[b]	− .87	×	SOVPRESS[c]	− 2.45	×	GERM[d]	− 1.75	× DOM[e]
	(6.41)		(10.44)		(−.29)			(−0.48)			(−0.58)	
GDR[f]			F = 134.4			N = 23						
MILINR =	−61.3	+	1.58 ×	UNIR	+ 23.14	×	SOVPRESS	− 13.76	×	GERM		
	(−3.12)		(6.97)		(2.86)			(−1.16)				
Hungary			F = 39.97			N = 25						
MILINR =	24.5	+	.59 ×	UNIR	+ 10.28	×	SOVPRESS	− 1.12	×	GERM		
	(2.02)		(3.74)		(1.79)			(−.12)				
Poland			F = 45.85			N = 25						
MILINR =	35.00	+	.46 ×	UNIR	− 1.29	×	SOVPRESS	+ 8.47	×	GERM	+ 4.09	× DOM
	(4.56)		(4.84)		(−.26)			(1.04)			(1.02)	
Combined[f]			F = 55.32			N = 96						
MILINR =	16.45	+	.73 ×	UNIR	+ 9.83	×	SOVPRESS	− .52	×	GERM	− 4.09	× DOM
	(1.65)		(5.96)		(1.72)			(−.06)			(−.67)	

[a]MILINR = reported military budgets in constant prices.

[b]UNIR = Utilized National Income in constant prices.

[c]SOVPRESS = a dummy variable for Soviet pressure to increase military spending after the 1978 Warsaw Pact meeting.

[d]GERM = dummy variable for years following the signing of the treaties between the FRG and the East Europeans in the early 1970s.

[e]DOM = a dummy variable for years of or following violent domestic political conflicts.

[f]Military budget estimates for the GDR begin in 1962.

inclusion of a dummy variable for geographical location. This dummy variable took on a value of one for Northern Tier countries and zero for Hungary.

The results, shown in Table 16, are not robust. With this alternative measure, Soviet pressure to increase arms expenditures appears to have been a significant factor only in increased expenditures for Czechoslovakia, not for Hungary and the GDR, as in the previous model, although the coefficients are still positive. However, the coefficient for the combined estimate for Soviet pressure is significantly different from zero.

The role of economic growth in military spending decisions takes on a different complexion in this model. The percentage of UNI going to the military appears to *decline* as the economy grows for both Czechoslovakia and Poland and for the group as a whole. Military spending is income-inelastic for these countries. In other words, in hard times military spending is not reduced proportionally to UNI and in good times it does not rise as rapidly as consumption in other areas.

EXTERNAL THREATS

The East European and Soviet leaderships ascribe the reason for military spending to an external threat, NATO. Erich Honecker, First Secretary of East Germany's Communist Party, summed up this view:

> Faced with imperialism's increasing aggressiveness and its counter-revolutionary practices, we must systematically improve our national defense. . . . Our armed forces must be continuously vigilant toward the changing, increasingly dangerous imperialist methods of class struggle . . . developed by the enemy to unleash and carry out aggression.[19]

This rationale has been repeated in all the other members of the Bloc at various times.

If these statements represent real fears of war (or possibly fears that external threats could weaken the position of the local leadership), one would expect to see the emphasis given the military decline during a period of better relations with potential adversaries.

Detente should have been such a period. Poland, Czechoslovakia, and East Germany signed treaties with the Federal Republic of Germany, purportedly their greatest external threat, in 1970, 1972, and 1973. The FRG established diplomatic relations with Czechoslovakia, Hungary, and Poland and created a new framework for relations with

[19]Honecker, 1979, pp. 49–50.

Table 16

THE PERCENTAGE OF UNI DEVOTED TO MILITARY SPENDING
(T-statistics in parentheses)

Czechoslovakia MILPER[a] =	7.15 (21.5)	−	F = 68.8 .02 (−4.30)	× UNIR[b]	+ .45 (2.30)	N = 24 × SOVPRESS[c]	+ .24 (.72)	× GERM[d]	− .32 (−1.60)	× DOM[e]
GDR[f] MILPER =	.87 (1.17)	+	F = 21.7 .04 (4.29)	× UNIR	+ .38 (1.24)	N = 23 × SOVPRESS	− .87 (−1.95)	× GERM		
Hungary MILPER =	2.5 (5.41)	+	F = .5 .004 (.71)	× UNIR	+ .14 (.62)	N = 24 × SOVPRESS	− .31 (−.39)	× GERM		
Poland MILPER =	5.0 (19.67)	−	F = 14.6 .008 (−2.45)	× UNIR	− .009 (−.05)	N = 24 × SOVPRESS	− .29 (−1.05)	× GERM	+ .22 (1.63)	× DOM
Combined[f] MILPER =	3.9 (6.94)	+	F = 1.29 .005 (.81)	× UNIR	+ .30 (.92)	N = 96 × SOVPRESS	− .78 (−1.66)	× GERM		
Combined[f] MILPER =	3.6 (9.40)	−	F = 28.9 .009 (1.87)	× UNIR	+ .45 (2.02)	N = 96 × SOVPRESS	+ .17 (.51)	× GERM	+ 1.87 (10.36)	× TIER[g]

[a]MILPER = reported military budgets as a percent of UNI.

[b]UNIR = Utilized National Income in constant prices.

[c]SOVPRESS = dummy variable for Soviet pressure to increase military spending after the 1978 Warsaw Pact meeting.

[d]GERM = a dummy variable for years following the signing of the treaties between the FRG and the East Europeans in the early 1970s.

[e]DOM = a dummy variable for years of or following violent domestic political conflicts.

[f]Military budget estimates for the GDR begin in 1962.

[g]TIER = a dummy variable for Northern Tier states.

the GDR at this time. Not only did political relations with the Federal Republic change dramatically, but commercial, cultural, and political relations improved greatly with the rest of NATO as well. If external relations have greatly affected military expenditure decisions in the NSWP, changes in expenditures in this period should reflect this improvement.

Parameter estimates of the first model outlined above indicate that detente had no effect on NSWP military spending. None of the estimates of the coefficients for the dummy variable for improved relations with the FRG was significantly different from zero at the 5 percent level (Table 15). Despite the amount of propaganda directed toward West German "revanchism," the external threat of West Germany does not seem to have been an important factor in determining military expenditures in these four countries during the 1960s, 1970s, or early 1980s. The results of the second model are similar. The dummy variable for better relations with the FRG was insignificantly different from zero or positive for all countries except the GDR.

Estimates were also made for an alternative specification, substituting the percentage of FRG military spending in FRG utilized national income for the dummy variable under the assumption the East European leaderships pay closer attention to actions than words.[20] Estimates of coefficients using this variable differ little from the first model. The estimate of the coefficient for Czechoslovakia is positive and is significantly different from zero using a one-tail test at the 5 percent level. Estimates for the other countries and all the countries combined were insignificantly different from zero. In fact, with the exception of Hungary, the estimates were all negative.

DOMESTIC UNREST

Since World War II East European history has been punctuated by mass outbursts against the Communist authorities. The local military establishments are not immune from these developments. The Hungarian army disintegrated during the Soviet invasion in 1956; only one unit appears to have stood with the Soviets.[21] The Czech officer corps contributed to political liberalization in 1968 through their own criticisms of Warsaw Pact doctrine in relation to Czech national

[20]The percentage of output the FRG devotes to military spending was used as a proxy variable for the potential military threat posed by the FRG.

[21]Mackintosh in Holloway and Sharp, 1984, p. 46.

interests.[22] Some Polish soldiers reportedly agitated for independent trade unions within the military during the Solidarity period. Polish soldiers fired upon striking workers in 1970 in Gdansk and Jaruzelski was able to rely on army support when he used the police to quell Solidarity in 1981–82.

Because the military has been so closely involved in these events, one would think expenditures on the military would fluctuate during periods of crisis. Ciaston notes that Polish expenditures on defense declined in 1957 and 1958 in Poland because of the domestic situation.[23] This period marked the reinstatement of Gomulka and the ouster of Soviet officers from the Polish military.

In order to test this hypothesis a dummy variable was inserted into the expenditure model for periods of violent unrest. These periods were Poland in 1970, 1976, and 1980–82, and Czechoslovakia in 1968. Repercussions on military spending were assumed to occur both within the year of the disturbance and subsequently.[24]

This test indicates that domestic disturbances had no discernible effect on military expenditures in Czechoslovakia and Poland. This result probably does not extend to expenditures on security forces. It may reflect the fixed nature of many military costs (food and clothing for personnel, operations and maintenance of existing equipment, purchase commitments for some types of military equipment, etc.) or may indicate that the priority of military spending for East European leaderships remains insulated from domestic disturbances.

PRESSURE FROM THE LOCAL MILITARY ELITES

Even though there are many prima facie reasons why most members of NSWP leaderships may not wish to increase military spending, one would expect their military establishments to hold an opposing view. The prestige, degree of power, and salaries of the military depend in part on the size of the military budget. In the normal course of events one would expect the military to lobby for more money.

The military has several avenues through which it can present its case. First, in 1985 in Bulgaria, the GDR, Poland, and Romania, the Minister of Defense or senior commanders had seats on the Politburo.[25] The most notable example in this case is Poland where several members of the armed forces, past and present, are in the Politburo or

[22]Johnson, Dean, and Alexiev, 1982, p. 115.

[23]Ciaston, 1969, p. 31.

[24]Details are provided in App. D.

[25]Radio Free Europe Report, 7 June 1985, Part III.

the Council of Ministers and General Jaruzelski is First Party Secretary. In essence these members of the military are in a position to directly represent the military's interests in all these countries. However, some individuals, such as Ustinov in the Soviet Union, may merely represent the Party's domination of the military.

A second avenue is through ties to Soviet commanders. Former members of the Polish political and military elites say that Polish officers complained to their Soviet comrades if they believed the domestic political leadership was shorting their needs. The Soviet commanders would then complain to the Kremlin, which in turn would apply pressure to the Poles. These statements imply somewhat more voluntarism in both the political systems and the military than is often assumed in Eastern Europe, however.

Volgyes (1982b) argues that heavy industry is an important ally of the military. For Czechoslovakia or Poland where the arms industry appears to be of some importance this may be true. For the GDR and Hungary, however, the linkage seems weaker because the military is probably not an important customer for these groups. Ministers in charge of heavy industries in Bulgaria and the GDR do have seats on the Politburos, however, so if a military-industrial lobby exists, it is represented on the top decisionmaking bodies in these countries. In 1985, the country with the highest percentage of UNI devoted to the military, the GDR, had both the Minister of Defense and a minister in charge of an industry on the Politburo. Only in Bulgaria and Poland is the military-industrial complex also so heavily represented.

To test the hypothesis that the military-industrial complex affects military expenditure levels in the NSWP, I regressed the percentage of military spending in utilized national income on my estimates of the percentage of military output in the output of the machinery industry. If the military-industrial complex in these countries greatly affects expenditure decisions, and the size of the military-industrial complex is positively correlated with its influence, countries with higher levels of military production should exhibit a higher percentage of military spending in UNI.

The results, recorded in Table 17, indicate that for Czechoslovakia and Hungary the percentage of military equipment production in total machinery production tends to rise as the percentage of military spending in UNI rises. This may merely mean that when military spending booms, so does military production.

The estimates for the group as a whole indicate that Czechoslovakia and Poland, with a higher percentage of military production in machinery production, devote a higher share of UNI to the military. Causality may run either way. Countries that spend more on the

Table 17

THE RELATIONSHIP BETWEEN MILITARY PRODUCTION AND MILITARY SPENDING
(T-statistics in parentheses)

Czechoslovakia				F = 12.2	N = 13
MILPER[a] =	4.14	+	.09	× MILPROD[b]	
	(18.14)		(3.49)		
Hungary				F = 23.47	N = 10
MILPER =	2.17	+	1.43	× MILPROD	
	(15.19)		(4.85)		
Poland				F = .18	N = 15
MILPER =	4.25	−	.08	× MILPROD	
	(3.33)		(−.42)		
Combined				F = 73.63	N = 38
MILPER =	2.67	+	.22	× MILPROD	
	(16.03)		(8.58)		

[a]MILPER = the percentage of reported military budgets in UNI.

[b]MILPROD = the percentage of estimated military equipment production in global output of machinery.

military are more likely to produce more military equipment; this does not mean that the military-industrial complex in those countries has the ability to raise military spending to higher levels than it would otherwise be.

During the period of analysis (1960–84) the position of the military has greatly increased only in Poland. In 1981 Defense Minister Wojciech Jaruzelski became premier, then First Party Secretary; subsequently he initiated a military crackdown during which many officers took important positions in the Polish government. If General Jaruzelski and his military associates have a greater preference for military spending than their civilian counterparts and have successfully imposed these preferences on the government, the rise in military spending should be detectable.

Since December 1981, the percentage of Polish utilized national income devoted to the military has risen from an average of 3.61 percent of UNI during the Gierek era to 3.71 percent between 1982 and 1984. This increase is very small, only .1 percentage point.

A further test of the hypothesis that the Jaruzelski government has had a greater preference for military spending than past Polish regimes

was made by regressing Polish military expenditures in constant prices on utilized national income in constant prices and a dummy variable for type of regime. The dummy variable took the value of zero for pre-Jaruzelski regimes and one for years after 1981. The results of the regression were:

$$\begin{array}{lcccccc} & F = 24.85 & & N = 25 & & \\ \text{MILPER} = & 5.21 & - .01 & \times \text{UNIR} & + & .012 \times \text{JARUZ} \\ & (28.5) & (-6.83) & & & (.07) \end{array}$$

The regression indicates that the current Polish regime has not spent significantly more on the military than past governments. The dummy variable, although positive, is not significantly different from zero. Alternative models incorporating dummy variables for domestic unrest, Soviet pressure, and detente gave similar results.

V. THE FUTURE PROSPECTS FOR EAST EUROPEAN MILITARY SPENDING

PEERING INTO THE FUTURE

Extrapolation from the past is generally a hazardous exercise. The future always surprises. Nonetheless the analysis of the previous section provides some hints on the plausible course of military spending in Eastern Europe over the next few years.

Since 1960 (the first year of the data series) economic wherewithal has been the primary determinant of military spending in these four countries. This held across the board. Domestic unrest appeared to have little effect on expenditures, one way or another, nor did improvements in relations with the Federal Republic of Germany, nor did the installation of a military regime in Poland in December 1981. The GDR appeared to have responded to Soviet pressure to increase military expenditures in response to the NATO 1978 3 percent decision. The other three countries reported a marked deceleration in the rate of increase in military spending after that year. In some years reported military spending in these countries even appeared to decline in real terms. Estimates of the parameters of the two models provided some evidence that Hungary and Czechoslovakia responded to Soviet pressure. In the model of the determinants of military spending levels the estimate of Soviet pressure for Hungary was positive and statistically significant at 5 percent level of error, implying that since 1979 Hungary may have increased reported military spending above and beyond what it otherwise would have been, given its economic situation. Czechoslovakia may have increased the reported percentage of utilized national income it devotes to the military since 1979 above and beyond what it otherwise would have done. But if Soviet pressure to increase military expenditures affected spending decisions in Hungary and Czechoslovakia following the November 1978 Pact meeting, it merely forestalled part of the decline in the rate of growth in expenditures, it definitely did not lead to an acceleration.

Extrapolating these results into the future rests on the assumption that the main features of the present political situation in Eastern Europe will remain the same. The comments below rest on the assumption that the Warsaw Pact will remain alive and well for the foreseeable future and Eastern Europe will continue to lie within the Soviet sphere of influence. Less certain is the future course of Soviet policy toward Eastern Europe, especially in terms of the role of East

European forces within the Warsaw Pact. Will the Soviet leadership eye the prospect of substituting East European forces for Soviet forces in Eastern Europe with more favor if Soviet economic growth continues to be so slow? Or will the Soviets decide that East European equipment has become so outmoded and the East Europeans forces so unreliable that they need to rely increasingly on their own forces? In the first case, East European leaderships could face much stronger Soviet pressure to increase military spending. In the second, Eastern European forces might be relegated to an even smaller role in Warsaw Pact military planning, but Soviet pressure to increase spending could diminish. In either case, the analysis in Sec. IV may no longer be indicative. This said, some probable paths for military spending in these countries are charted below.

EAST EUROPEAN MILITARY SPENDING IN THE NEXT SEVERAL YEARS

Czechoslovakia

After the GDR the Czechs devote the second largest share of utilized national income to the military of any of these countries. Since 1979, however, spending has increased in real terms at the lowest average annual rate of the four. Expenditures have fluctuated from year to year in both nominal and real terms.

Czechoslovakia's poor economic performance appears to be a major factor constraining military spending. Now that Czech utilized national income has begun to rise again after declines in the early 1980s, the Czechs have more wherewithal to devote to the military. However, UNI has only recently regained the level reached in 1980.

Although utilized national income is rising again, large increases are unlikely. Czech industry, which contributes most to economic output, continues to employ energy-intensive and materials-intensive production techniques. Therefore, industrial output has been constrained by the small increases in supplies of these goods. Czechoslovakia has reduced its hard currency debt, so the financial pressure to generate convertible currency trade surpluses has diminished. But the Czechs will probably face increasing pressure to reduce their ruble trade deficit with the Soviet Union, especially as the Soviets find their own external financial position deteriorating because of the decline in the world market price of their primary export commodity, oil.

Because Czechoslovakia will probably continue to record low rates of increase in utilized national income, military spending is likely to

continue to increase at low rates in real terms or even stagnate, as it did in the 1982–84 period. The leadership will probably feel pressed to channel increases in output to restoring investment levels, expanding consumption and servicing the ruble debt. Military spending may well take a back seat to these concerns.

Other factors that could influence military spending levels also do not presage dramatic increases. There has been no abrupt increase in the role of the military in the Czech Party or the government. There has also been no change in the number or types of maneuvers engaged in by the Czech army, indicating no new Warsaw Pact demands on the Czech armed forces that would necessitate a jump in military expenditures.

The GDR

The GDR is the only country of the four that appears to have accelerated military spending since 1978. The nominal average annual rate of increase jumped from 4.6 percent during the 1972–78 period to 6.8 percent between 1979–85, an increase in the rate by almost half. Because the GDR has pushed its hard currency current account balance into the black and is now roughly in balance in ruble trade with the Soviet Union, no new external demands on the East German economy are in the offing. The country has also recorded rapid rates of economic growth in recent years. If these continue, the GDR will have the economic wherewithal to continue increasing military spending, although the leadership may prefer to spend a large share of output increments on restoring investment expenditures to previous levels.

The puzzling question is what motivates the East German leadership to spend as much as they do on the military. The analysis in Sec. IV indicates that the GDR leadership is the only one to have heeded Soviet requests for higher expenditures. Continued Soviet pressure to spend more on the military may remain a factor pushing the GDR to increase military spending. But the Soviet leadership appears to have restrained military spending in the USSR itself in recent years and Gorbachev appears to be emphasizing arms control and investment rather than military spending. His choice of priorities should make it more difficult for him to argue for continued increases in military spending by Soviet allies, including the GDR. Possibly the GDR leadership views military spending as a means to buy off Soviet opposition to other GDR policies, but the Gorbachev leadership also appears to be less opposed to East European foreign policy heterodoxy than its predecessors. High military budgets seem an expensive way for the GDR to buy off fading Soviet opposition to its foreign policies. For

these reasons a decline in the rate of increase in East German military spending would not be surprising.

Hungary

Since 1981 real increases in Hungarian military spending appear to have averaged a little over 1 percent a year. Hungary's persistent problems in servicing its hard currency debt and the consequent low rates of economic growth indicate that small increases in military spending in real terms are likely to characterize the next few years as well.

Political factors also provide no reason to expect a surge in military spending. Hungary has a small army and does not border on any NATO countries, nor does it appear to have an important role in Pact military planning. Large increases in Hungarian military capabilities would probably threaten Yugoslavia and Austria. It is difficult to imagine that threatening these two neutrals is a Hungarian policy goal. Although the Soviets may want the Hungarians to modernize their forces, the rate of increase in Hungarian military expenditures more than halved after Soviet requests for increased expenditures in 1978. There seems to be no rationale for Hungary to respond with more alacrity now. Moreover, the Soviets appear to be expending their political clout on economic rather than military matters. The Hungarians have suffered a painful readjustment of their trade accounts with the Soviet Union in 1985 and 1986. They eliminated their ruble trade deficit in 1985 in part by diverting goods sold to the Soviets from hard currency to ruble trade. This diversion contributed to a sharp decline in Hungary's overall hard currency trade surplus, aggravating problems in servicing its debt. The Soviets should find it difficult to push for much higher Hungarian military expenditures at a time like this, especially because the Hungarian leadership has evinced no desire to accelerate military spending.

Poland

Czechoslovakia and Hungary appear set to maintain low increases in military spending. The GDR will probably be able to maintain the rapid increases recorded in recent years, but the leadership may find it politically wise to reduce increases. Poland is more of a conundrum.

Traditionally, the Polish army has been the largest, best-equipped army in the Pact.[1] The Polish economic depression has slowed modernization programs and limited expenditures. By this time it appears

[1]Stachow in Gabriel, 1983, p. 240.

that the Poles have begun to lag the East Germans and the Czechs in terms of military modernization.[2] General Jaruzelski continues to rule Poland and other military officers continue to occupy important positions in the Polish government. Although I could detect no evidence using statistical methods that they have increased military spending to levels higher than would otherwise have been the case, one would expect they would be more sympathetic toward funding the military than other government leaders. Substantial nominal increases in military spending in 1984 and 1985 may presage the beginning of a modernization program over the next few years. Poland may be the one country where military spending may accelerate.

Two factors are likely to limit military spending in Poland, however: economic wherewithal and the domestic political situation. Polish economic growth rates have been decelerating since the initial recovery in 1983. Labor productivity has risen, but Polish industry continues to consume energy and materials at far higher rates than industries in the West. Poor organization and shortages continue to characterize the economy. Hard currency debt continues to rise, and Poland has also built up substantial ruble debts to the Soviet Union. The Soviet Union has served notice that Poland is to start repaying its ruble debts in 1988. Poland's recent admission to the International Monetary Fund could lead to more concerted Western pressure for the country to start repaying its hard currency debts as well. If this is the case, debt service could absorb most of the increments in Polish output over the next several years. Aside from these pressures to export, Polish producers and economists have been urging increased investment to counteract the effects of the investment declines over the past decade. These two sources of increased demand would leave little for more military spending.

Another source of increased demand comes from Polish consumers. The Polish government has successfully contained the opposition in recent years but has also been very attentive to popular desires to regain the living standards of the late 1970s. This political pressure for more consumption will also tend to limit expenditures on military modernization.

In short, the military, like other groups in Polish society, has suffered from Polish economic problems. It too is probably lobbying for more funds and may face a more receptive audience in Warsaw than other groups. But the enduring economic difficulties of Poland render the possibility of a large surge in military spending doubtful.

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[2] *The Military Balance, 1984-85.*

Appendix A

RECONSTRUCTING THE MILITARY BUDGETS

PERSONNEL COSTS

National Armies

To compute personnel costs I used the Alton technique of multiplying civilian cost-of-living and wage data by estimates of military personnel (total armed forces, draftees, and security forces funded by the Ministry of Defense) from *The Military Balance* published by the International Institute of Strategic Studies. Nonwage costs were calculated using per capita expenditures on food, clothing, hygiene, and tobacco by a typical working class family.[1] Tobacco and food consumption may suffer from a downward bias, and expenditures on clothing and hygiene may suffer from an upward bias through this method, because soldiers probably consume more of the former and less of the latter than civilians. The total margin of error is probably low, however. These figures were multiplied by the personnel numbers to arrive at a figure for nonsalary personnel costs.

Total military salary costs were calculated by multiplying nonconscript force estimates by the average salary of administrative workers in the case of Hungary and Czechoslovakia, or of employees in the legal and penal systems in the case of Poland and the GDR.[2] Conscript salary costs were calculated by multiplying 5 percent of average military wages by estimates of total conscripts, except for the GDR where a figure of 7 percent was used.[3]

Table A.1 compares my estimates with those of Alton et al. The two series differ because we used different salary schedules and my

[1]In all three countries the armed forces provides food, clothing, housing, hygienic products, and tobacco gratis to personnel. Housing costs are assumed to be covered in the budget for military construction. Breakdowns for hygienic products were available only for Hungary and Poland.

[2]Numbers of enlisted men and officers in the armed forces after 1974 were calculated by subtracting the number of conscripts from total force levels; pre-1975 figures were estimated by multiplying the average proportion of nonconscripts in total forces post 1974 by figures for total personnel. All figures were taken from *The Military Balance*, various years.

[3]L. W. International found conscript wages run at about these levels (Gregor Lazarczik, private communication).

coverage of nonsalary personnel costs is probably somewhat narrower. My estimates also include paramilitary forces funded by the Ministry of Defense.

Subsistence Costs of Soviet Troops Based in Eastern Europe

Section II provides estimates of the potential subsistence costs in domestic currencies of Soviet troops based in these four countries. Costs were calculated by multiplying the number of Soviet troops stationed in each country by the estimates of subsistence cost per soldier for that country. Figures for Soviet troops were taken from various editions of *The Military Balance*. For earlier years only the numbers of Soviet divisions in the countries were given, not total numbers of men. For these years the number of each type of division, armored and motorized, were multiplied by figures for the number of men in each type of Soviet division.

DOMESTIC PROCUREMENT OF MILITARY DURABLES

The three countries for which procurement of military durables was estimated publish input-output tables. In all three cases, I attempted to identify the column that includes military spending in the tables and estimate procurement of military durables from the cells for engineering industries in this column.

Czechoslovakia

The Czechs have published five input-output tables since 1960 (1962, 1967, 1973, 1977, and 1982). Three industrial branches in the tables were assumed to produce military equipment: machinery, electro-technical and metalworking, and "other industrial production." In the case of Hungary and Poland the category "other industrial production" does not appear to contain arms production; output from this sector is fairly small. This category is included in the case of Czechoslovakia because it is large relative to other branches and a large share of its final output is purchased by the Czech government or exported. Moreover, exports and imports in this category, when summed with exports for the machinery and electro-technical sector, appear to be more consistent with figures for machinery trade in the annual statistical handbooks than machinery and electro-technical trade alone. Without it there is a large discrepancy in the figures

Table A.1

ALTON PERSONNEL COST ESTIMATES AS A PERCENT OF RAND ESTIMATES

	Czechoslovakia (koruna)			East Germany (marks)			Hungary (forints)			Poland (zlotys)		
Year	Total	Wages	Subsis-tence	Total	Wages	Subsis-tence	Total	Wages	Subsis-tence	Total	Wages	Subsis-tence
1965	81.2	54.9	121.6	49.5	35.3	89.5	87.2	85.2	89.4	61.7	56.8	69.5
1966	85.3	58.4	127.9	49.4	35.9	84.9	83.2	83.2	83.1	60.7	54.7	71.0
1967	85.3	57.3	130.9	50.5	36.2	89.8	88.3	92.4	83.8	58.3	51.2	70.9
1968	86.2	56.8	134.5	55.2	40.1	97.3	84.1	88.8	79.0	58.4	51.2	71.1
1969	83.8	53.2	135.1	59.6	43.7	101.9	86.5	93.0	79.7	58.5	51.2	70.9
1970	96.3	73.5	132.7	59.6	45.1	99.2	85.2	85.2	85.2	60.5	54.0	70.8
1971	91.1	67.3	129.4	61.2	48.0	96.6	76.0	79.1	72.4	59.3	51.9	71.2
1972	90.7	67.2	128.6	62.4	49.8	95.6	75.6	76.7	74.3	58.8	50.5	73.3
1973	90.2	66.5	127.8	61.3	47.5	95.4	77.6	77.2	78.2	56.9	47.8	73.4
1974	89.0	64.5	128.0	57.8	44.6	90.8	77.8	79.4	75.7	55.7	48.7	67.4
1975	76.0	52.3	116.1	62.2	48.9	90.8	72.6	66.4	83.0	54.0	45.2	71.8
1976	84.0	56.8	129.9	57.1	44.6	85.7	81.3	81.8	80.6	66.0	54.6	88.6
1977	83.3	55.9	130.2	57.1	44.7	85.4	63.8	59.9	71.0	70.9	61.0	88.8
1978	82.1	56.7	122.8	59.3	46.6	88.5	73.5	77.7	67.5	64.3	55.4	80.2
1979	80.7	56.2	118.6	59.0	45.8	90.4	67.2	63.8	73.5	63.6	55.7	76.6
1980	81.4	56.0	121.8	59.7	45.5	94.5	82.8	79.9	87.4	65.3	56.4	80.8
1981	80.6	55.9	119.7	58.1	44.0	93.0	72.9	66.0	84.9	72.0	62.0	88.8
1982	78.9	54.4	118.0	59.1	45.1	93.3	64.1	59.0	73.0	77.9	58.5	103.6
Average	84.8	59.1	126.3	57.7	44.0	92.4	77.7	77.5	79.0	62.4	53.7	77.1
Standard Deviation	4.9	5.8	5.7	3.9	4.2	4.7	7.5	10.2	6.0	6.0	4.3	9.3

(Table A.2). Since arms exports appear to be categorized under machinery exports, this discrepancy seems significant.

Purchases of material goods appear to be recorded within collective consumption, as argued in Sec. II. Military procurement was estimated under this assumption. Input-output figures for collective consumption from these three industries were summed. Then estimates of consumption of these goods in the production of medical, educational, and cultural services were subtracted from this figure. These estimates were calculated by multiplying gross expenditures on these services, a measure of gross output, by the average Hungarian input-output coefficients for machinery inputs into these categories. Considering that the Czech and Hungarian economies are roughly on the same level of development and that machinery inputs in the production of these services are limited, this assumption does not seem unduly strong. The difference was assumed to equal military procurement. Because other governmental units, such as law enforcement and administration, also consume these products in the production of their services, these figures are upper bounds.

Procurement estimates for years in which input-output tables were not published were estimated by averaging the coefficients for bracketing years and multiplying these averaged coefficients by estimates of collective consumption constructed from national income data so as to be consistent with figures used in the input-output tables. Input-output figures for collective consumption differed from the national income accounting figures, apparently because the latter include depreciation. This consumption of capital goods appears to be captured in the investment figures of the input-output tables. Consequently,

Table A.2

OTHER INDUSTRIAL OUTPUT AND CZECH MACHINERY TRADE STATISTICS

Year	Total Machinery Imports[a]	I-O Machinery Imports	I-O Machinery + Other Imports	Total Machinery Exports[a]	I-O Machinery Exports	I-O Machinery + Other Exports
1962	7596.3	6996.1	7107	14630.2	15110.4	15126.7
1967	16138.7	13276.7	15639.3	27410.7	22968.3	25574.6
1973	29463.4	32945.4	38460.2	49914.0	35092.9	44148.3
1977	53869.7	45941.6	53991.9	59189.4	39790.1	51576.8
1982	56647.6	47490.0	57817.4	84261.0	58066.4	73186.1

[a]Estimated from trade data in the statistical yearbooks and exchange rates in Havlik, 1985.

national income accounting figures for collective consumption were reduced to the average levels recorded in the input-output tables before procurement was estimated.

Hungary

The Hungarians have published detailed input-output tables constructed on a GDP, rather than NMP basis almost every year since 1968. Tables for 1969–1972, 1981, and 1982 were published in *Statisztikai Evkoenyv (SE)*, the Hungarian statistical yearbook. Tables for 1970–1979 were published in *Agazati Kapcsalatok Merlege, 1970–1979* (Input-Output Tables, 1970–1979). Tables for 1970–1975 in the latter source were revised to conform to the methodology used after 1975.

In the 1969–1972 set of tables in *SE* (henceforth Tables A) the military appears to be incorporated into the category "administrative and other services." The sum of resources allocated to economic tasks, administration, law enforcement, and the military in the national budget is very close to the I-O figures for administrative and other services available for final consumption (Table A.3).

Unfortunately, the breakdown for services in the set of tables in *Agazati Kapcsolatok Merlege, 1970–1979* (henceforth Tables B), is coarser than in Tables A. Services are split among three categories rather than six. Furthermore, only one of the new categories, health, social, and cultural services, appears to equal the sum of two former categories. The other two new categories—personal and economic services, and communal, administrative, and other services—are combinations of parts of four former categories, the exact breakdown of which I was unable to determine. Nonetheless, defense still appears to be in the administrative and other services category. As can be seen from Table A.3, the sum of administrative, law enforcement, economic tasks, and defense expenditures is roughly equal to gross output in this category.

An additional test of the hypothesis that defense falls into this category is to compare estimates of expenditures on food and clothing made using the building block method and estimates of arms imports from the Soviet Union and Czechoslovakia constructed from trade data, with figures from the I-O tables constructed with trade data (Table A.4). The figures for clothing and shoes and for arms imports easily fit into the input-output figures. Since the I-O figures cover administrative and communal services, it is reassuring rather than surprising that the I-C categories are substantially greater than the building block and trade residual estimates. The differences in estimates of expenditures on food are disturbing, however. Possible

Table A.3

HUNGARIAN INPUT-OUTPUT AND BUDGET FIGURES

Year	Defense Budget	I-O Figures[a] for Defense Spending	Budget[b] Figures	I-O Figures[c] for Communal, Administrative, and Other Services	Percentage Difference Between (4) and (5)
(1)	(2)	(3)	(4)	(5)	(6)
1970	9848	10050	26803	26661	100.5
1971	9891	10946	30333	28816	105.3
1972	9430	10736	30971	29839	103.8
1973			33223	31113	106.8
1974			35516	35684	99.5
1975			39476	38084	103.7
1976			40196	40230	99.9
1977			42923	42837	100.2
1978			49145	50753	96.8
1979			51429	55849	92.1
1980			55985		
1981			71260	66785	106.7
1982			76500	71689	106.7
Average					101.8
Standard Deviation					4.3

[a]This figure was derived by subtracting expenditures on administration, law enforcement, and economic tasks listed in the national budget from the figures for final output of administrative and other services given in the input-output tables in the statistical yearbooks between 1970–1973.

[b]The sum of budget expenditures on administration, law enforcement, economic tasks, and defense.

[c]The figures for gross output of economic, administrative, and other services given in the input-output tables in *Agazati Kapcsolatok Merlege, 1970–1979.*

explanations for this discrepancy are: (1) The military is fed with lower cost food than purchased by civilian households (the building block estimates are too high), (2) food costs are absorbed elsewhere (the official budget figures understate real costs of defense), or (3) food is purchased from retailers and wholesalers and appears in the figures for domestic trade in the I-O tables. This last hypothesis is consistent with the I-O figures for domestic trade.

If military spending does fall into this category, machinery inputs in this category's column plus arms imports from the Soviet Union and Czechoslovakia set an upper bound on domestic military procurement (Table 5). These figures fall into the military budget averaging 42.5 percent of the total budget, a reasonable figure. In no year do the

estimates exceed 60 percent of the reported budget. Only in 1974 and 1979 do they seem high, when reasonable figures for operations and maintenance are also added in.

A further problem arises because input-output tables have not been constructed for every year. Coefficients for years in which the tables failed to appear were constructed by using the closest table. Military procurement may form a fairly constant share of the military budget (military services may demand a fairly constant input of material and equipment). However, it probably fluctuates much more than a more traditional input in an input-output table. Thus, the assumption of fixed coefficients is a strong one. Given the number of tables, however, this has not been a great problem for recent years. Estimates for years before 1969 are probably subject to more error.

Poland

The same approach used to calculate procurement for Czechoslovakia was used for Poland. Poland has also published several input-output tables, especially in recent years.[4] Unfortunately, with the

Table A.4

I-O DATA AND RAND ESTIMATES OF MILITARY PERSONNEL COST FOR HUNGARY[a]

Year	I-O Food Industry	RAND Food Estimate	I-O Domestic Trade	I-O Light Industry	RAND Clothing and Shoes Estimate	I-O Imports	Arms Imports (SU & Czech)
1970	150	746	2130	2044	306	2721	
1971	137	980	1900	1751	334	5398	
1972	104	1017	1631	1432	363	6503	
1973	116	1034	1415	1385	345	6897	
1974	112	1060	1588	1487	378	9534	
1975	85	825	1228	1393	368	11228	
1976	108	865	1709	1914	346	8926	4370
1977	96	964	1736	1869	354	9549	3803
1978	118	1052	2511	2380	394	11550	5561
1979	136	1068	2442	2626	376	14061	7927

[a]RAND estimates were made using the methodology described under "Personnel Costs" above. The I-O figures are inputs in the Command Administrative and Other Services column in Table B.

[4]Tables have been published for 1961, 1962 (two versions), 1967, 1969, 1971, 1972, 1973, 1975, 1977 (two versions), 1980, 1982, and 1983.

exception of a version of the 1977 table published in 1981,[5] the Poles have used Net Material Product rather than the Standard National Accounts (SNA) format. Moreover, the tables differ from the Czech and Hungarian tables in their treatment of trade. Some tables record only net exports within a residual for changes in stocks and statistical imbalances; others record exports and imports separately, with the 1983 table including imports in final demand for the first time. These differences create several puzzles but also shed some light on the location of military spending.

The most provocative indicator is provided by the SNA version of the 1977 table (published in 1981 during the height of the Solidarity era) in which the input column for "Science, Technology, Administration, Law Enforcement, Finance, and Social and Religious Organizations" consists of zeros. All other service columns contain inputs. Unfortunately, the sum of national budget expenditures on science and technology, law enforcement and administration, and the military plus wages for individuals employed in finance is 30 percent greater than the gross output of this sector recorded in the input-output table. Therefore, military expenditures may not be in this column.

Even if the military is lodged here, the question remains of where military inputs are. The introduction to the national income accounting section states that material production consumed for national defense falls into the category of collective consumption for general purposes.[6] Assuming that the same holds true for the input-output tables, military procurement should be located in that portion of the final output of the metal-working, machine-building, precision engineering, motor vehicle, and electronics industries directed to general (nonpersonal) consumption. These figures place extreme upper bounds on military procurement. Like the Czech figures, they were reduced to eliminate estimated machinery inputs used to produce health, cultural, and educational services. The average input-output coefficient for machinery inputs into these services from the Hungarian tables was multiplied by Polish budgetary figures for these services to estimate Polish machinery inputs. These estimates were subtracted from the I-O figures to generate estimates of domestic procurement. See Table A.5.

Since input-output tables were not available for every year, procurement figures for years without a table had to be estimated. Coefficients for intervening years were estimated by taking the average of the coefficients of the bracketing I-O tables. Coefficients for the earliest

[5] *Rocznik Statystyczny*, 1981, pp. 94–97.

[6] *Rocznik Statystyczny*, 1984, p. 70.

Table A.5

EAST EUROPEAN PROCUREMENT OF MILITARY DURABLES[a]
(1970 = 100)

	Czechoslovakia		Hungary		Poland	
Year	Real Terms	Nominal Terms (Koruna)	Real Terms	Nominal Terms (Forints)	Real Terms	Nominal Terms (Zlotys)
1960	NA	3556.3	76	1621	33.2	2311.1
1961	52.8	3905.9	87	1873	32.0	2270.3
1962	55.9	4183.1	102	2235	36.9	2704.0
1963	82.6	6218.9	107	2364	41.2	3043.2
1964	85.1	6438.9	110	2443	45.4	3377.8
1965	88.0	6733.6	112	2535	52.4	3919.8
1966	89.3	6855.4	107	2512	56.1	4260.6
1967	106.8	8310.7	94	2400	66.8	5122.3
1968	92.4	7358.6	110	2958	76.3	5897.8
1969	94.5	7722.1	112	3088	84.3	6542.6
1970	100.0	8298.6	100	2787	100.0	7846.2
1971	110.8	9194.1	122	3535	107.5	8381.2
1972	121.1	10038.9	139	4168	108.8	8352.7
1973	113.4	9411.4	135	4157	115.4	8886.8
1974	134.3	11125.1	180	5670	111.7	8847.0
1975	146.8	12144.4	169	5581	90.1	7323.7
1976	141.1	11700.2	168	5571	161.7	14030.0
1977	135.0	11762.3	134	4595	233.4	21443.6
1978	154.4	13470.8	189	6719	246.7	24506.6
1979	152.8	13381.3	263	9566	259.9	26093.0
1980	154.7	13797.4	159	5786	275.1	27979.4
1981	149.4	13971.9	167	6197	219.6	23119.4
1982	155.9	15678.4	159	6089	172.6	36204.7
1983	162.8	16327.6	210	8518	229.4	53920.9
1984	NA	NA	186	7917	259.0	68938.6

[a]Index numbers in real terms were calculated by deflating the nominal series by machinery price indexes or, during the 1960s, price indexes for nonconsumption goods and services.

and latest years were estimated using the coefficients of the closest year available. The coefficients were then multiplied by the figures for nonpersonal consumption provided in the table for gross utilized national income in the Polish statistical yearbook. In contrast to the Czech figures, these numbers were almost identical to the figures for "Social Consumption" in the I-O tables.

ARMS TRADE

Czechoslovakia

According to Vanous, the Czechs place arms exports within SITC categories 718 (other special machinery).[7] Czech arms exports were calculated by subtracting exports identified in this category from the total figure. The residual was assumed to equal arms exports. As noted in Sec. III, these estimates are upper bounds; part of this residual is patently not arms. They exceed ACDA estimates (Table A.6).

Table A.6

CZECH ARMS TRADE ESTIMATES
(Millions of transferable rubles)

	Imports			Exports			
						RAND	Vanous
Year	ACDA	RAND	Vanous (From the Soviet Union)	ACDA	RAND	(To the Soviet Union)	
1965		49.5			246.2	125.5	
1966	90	54.9		155	344.0	156.1	
1967	86	50.8		180	249.3	138.7	
1968	74	86.3		69	NA	NA	
1969	74	94.1		98	126.3	58.9	
1970	74	110.4		98	286.7	70.3	
1971	74	118.9		110	NA	NA	
1972	165	130.2		174	261.5	107.7	
1973	252	217.6		170	269.9	NA	
1974	242	229.8		250	289.6	NA	
1975	223	330.6		353	334.0	145.0	
1976	226	372.0		346	345.0	169.5	
1977	184	402.6		478	143.1	7.5	
1978	82	489.3		646	502.2	243.9	
1979	222	463.7		637	576.5	316.1	
1980	97	483.1	447.0	455	708.4	364.0	317.0
1981	230	503.8	476.0	432	886.5	445.6	389.0
1982	180	591.5	448.0	612		651.3	403.0
1983		639.8	570.0				525.0
1984		702.3					

[7]This is according to the pre-1982 SITC classification system. Vanous argues that in the revised classification system arms trade falls into SITC 728 (other equipment specialized for particular industries), 745 (other nonelectrical machinery, tools, and parts, n.e.s.) and 784 (motor vehicle parts and accessories, n.e.s.) since 1982. He also places unidentified machinery sales into the arms category (Vanous, 1985).

These data were recorded in dollars. They were converted to transferable rubles by multiplying them by the ruble-dollar exchange rate used in UN publications—the official Soviet rate. Czech official ruble-dollar cross-rates are equal to the Soviet figures. Ruble-domestic koruna rates computed by Havlik (1985) were used to convert these figures to domestic koruna.

Czech arms imports posed a more difficult problem. Czech I-O tables record both domestically produced inputs and imported inputs in each cell. As noted above, a large share of final output of the category "Other Industrial Production" goes to "Social Consumption" and exports. Moreover, exports and imports from this column, when added to trade figures from the machinery and electro-technical categories, generate figures more consistent with Czech machinery trade figures than the latter two industries alone (Table A.2). For these reasons imports from this row recorded in the "Social Consumption" column were assumed to equal arms imports. Estimates for years without I-O tables were calculated by taking the average share of these imports in machinery imports of the bracketing years and multiplying by total machinery imports converted to domestic koruna using an average of Havlik's (1985) exchange rates weighted by the shares of dollar and ruble trade in Czech machinery imports.

The GDR

Because of the paucity of data, no arms trade estimates were made for the GDR. Those recorded in Table A.7 are taken from ACDA (1985) and Vanous (1985).

Hungary

Because Hungary does not produce tanks or aircraft, a substantial share of procurement is imported, mainly from the Soviet Union. Vanous claims that this trade is recorded in machinery trade by the East Europeans, including the Hungarians, and in the unaccounted commodity residual by the Soviets. Consequently, the difference between Soviet and East European machinery trade statistics equals Soviet arms trade with these countries.

Vanous's approach was used here. Soviet machinery exports in rubles were converted into forints using Hungarian ruble-forint exchange rates. This figure was then subtracted from Hungarian machinery imports from the Soviet Union, and the residual was assumed to equal arms imports. The same procedure was used with Hungarian machinery exports and Soviet machinery imports to calculate Hungarian military exports.

Table A.7

GDR ARMS TRADE ESTIMATES
(Millions of transferable rubles)

	Imports		Exports	
Year	ACDA	Vanous	ACDA	Vanous
1966	148	NA	5	NA
1967	132	NA	5	NA
1968	114	NA	5	NA
1969	114	NA	5	NA
1970	114	NA	5	NA
1971	114	NA	5	NA
1972	281	NA	41	NA
1973	363	NA	37	NA
1974	371	NA	30	NA
1975	324	NA	36	NA
1976	414	NA	15	NA
1977	368	NA	66	NA
1978	245	NA	41	NA
1979	157	NA	26	NA
1980	104	459	78	170
1981	281	496	86	220
1982	324	598	108	284
1983	563	528	96	350

SOURCES: ACDA, various years; Vanous, 1985.

My estimates were close to Vanous's, but not identical (Table A.8). Differences are methodological; Vanous uses the unaccounted residual for Soviet trade with the CMEA to calculate total Soviet CMEA arms and then allocates this residual on the basis of Soviet machinery trade with the individual countries. I rely solely on Hungarian and Soviet bilateral trade data.

Imports of arms from Czechoslovakia were estimated by converting the estimates of Czech arms exports to Hungary outlined above to rubles and then to forints. For those years in which estimates of Soviet or Czech arms exports were not available, the average percentage of total imports in the administrative, communal, and other services category in the I-O tables taken by Soviet or Czech arms exports was used to provide arms imports estimates. Because of the lack of data, arms imports from other countries were not estimated. These are probably small.

Table A.8

HUNGARIAN ARMS TRADE ESTIMATES
(Millions of transferable rubles)

	Hungarian Imports				Hungarian Exports		
	ACDA	RAND	RAND	Vanous	ACDA	RAND	Vanous
Year	Total	Total	Soviet Union Only		Total	Soviet Union Only	
1966	23	54	NA	NA	0	NA	NA
1967	40	51	NA	NA	0	NA	NA
1968	34	64	NA	NA	0	NA	NA
1969	34	66	NA	NA	2	NA	NA
1970	34	49	NA	NA	2	NA	NA
1971	34	72	NA	NA	2	NA	NA
1972	58	91	NA	NA	8	NA	NA
1973	141	92	NA	NA	22	NA	NA
1974	144	127	NA	NA	45	NA	NA
1975	129	128	120	NA	36	3	NA
1976	158	141	125	NA	45	28	NA
1977	125	109	109	NA	44	62	NA
1978	184	175	167	NA	48	−281	NA
1979	150	277	248	NA	33	36	NA
1980	234	174	142	170	32	32	30
1981	50	195	185	183	65	79	76
1982	50	187	157	155	79	82	79
1983	NA	266	266	203	NA	92	131
1984	NA	203	203	NA	NA	112	NA

The figures for Hungarian arms imports from the Soviet Union are plausible, although probably exaggerated because of the two different reporting systems. The Soviets record all their data f.o.b. and the Hungarians record imports c.i.f. However, the arms import estimates run from one-fourth to one-third of total Hungarian machinery imports from the Soviet Union. Even if trade and insurance accounted for 5 percent of total imports (about 25–35 percent of the discrepancy), the remaining difference is so large that arms trade seems the most probable explanation. Moreover, the numbers easily fit into the published figures for the defense budget and into the I-O figures for imports for administrative, communal, and other services.

Hungary publishes fairly detailed breakdowns of trade by country and commodities. These data were used to check the plausibility of the import figures. Estimates of total Soviet arms exports to Hungary

would not fit into a single commodity category. However, figures for imports of "Other Machinery" and "Components and Spare Parts" were not subdivided by the Hungarians, and their sums are substantially greater than the estimates for arms trade, so arms imports may be hidden in these two categories.

The figures for arms exports are more doubtful. On the one hand, Hungarian exports and Soviet imports are both recorded f.o.b, so the discrepancy in these statistics cannot be ascribed to insurance and freight costs. These discrepancies are quite small, however, for all years except 1978 and 1982. Although Hungarian arms exports to the Soviet Union are probably minor, since Hungary has little in the way of an arms industry, my estimates are so small that they could just as well be ascribed to differences resulting from statistical collection techniques.[8] Moreover, the negative figure for 1978 is very puzzling. The most plausible explanation is that the Hungarians recorded shipments of machinery and materials for the Orenberg pipeline as exports in that year, while the Soviets placed them in a different category.

No attempt was made to estimate Hungarian arms exports to countries other than the Soviet Union. Hungarian arms production appears to be so small that it is highly unlikely that arms exports are detectable in the published data.

Poland

Vanous's approach was also used to calculate Polish-Soviet arms trade. Soviet machinery exports in rubles were converted into zlotys using Polish ruble-zloty exchange rates. These figures were then subtracted from Polish machinery imports from the Soviet Union and the residual was assumed to equal arms imports. The same procedure was used with Polish machinery exports and Soviet machinery imports to calculate Polish military exports. Unlike Hungary, Poland does not disaggregate trade by country according to the CMEA Trade Nomenclature system, but uses its own classification scheme. Items such as ship repairs and household appliances, included in the Polish statistics, had to be netted out in order to make the Polish data more consistent with the Soviet figures. This procedure doubtless introduced some error into the figures since Polish enumeration of trade in machinery with the Soviet Union excludes some items. Nonetheless the margin of error is probably small. Moreover, the resulting residual is so large

[8]Soviet imports are probably registered after the Hungarians register exports. Consequently, differences in exports and imports may be due to time lags.

that trade in arms offers the best hypothesis explaining the discrepancy.

The figures were close to Vanous's, but not identical (Table A.9). Differences are methodological; Vanous uses the unaccounted residual for Soviet trade with the CMEA to calculate total Soviet CMEA arms and then allocates this residual on the basis of Soviet machinery trade with the individual countries.

Total Polish exports of arms were estimated by subtracting estimates of procurement of domestically produced military durables from arms production estimates. These estimates should be treated with

Table A.9

POLISH ARMS TRADE ESTIMATES
(Millions of transferable rubles)

	Polish Imports				Polish Exports			
			RAND	Vanous			RAND	Vanous
Year	ACDA[a] Total	RAND Total	Soviet Union Only		ACDA[a] Total	RAND Total	Soviet Union Only	
	Rubles				Rubles	Zlotys	Rubles	
1966	136	67	NA	NA	128	9599	NA	NA
1967	128	74	NA	NA	130	10802	NA	NA
1968	109	80	NA	NA	136	12309	NA	NA
1969	109	87	NA	NA	139	14252	NA	NA
1970	109	95	NA	NA	136	10164	NA	NA
1971	109	70	NA	NA	156	11896	NA	NA
1972	215	91	NA	NA	116	11688	NA	NA
1973	304	126	NA	NA	170	14708	NA	NA
1974	273	151	NA	NA	144	19764	NA	NA
1975	252	171	NA	NA	122	31200	NA	NA
1976	293	237	NA	NA	248	28375	NA	NA
1977	272	274	NA	NA	324	26322	NA	NA
1978	122	307	NA	NA	442	30199	NA	NA
1979	131	329	301	NA	359	30556	244	NA
1980	110	415	387	362	341	32518	373	350
1981	317	548	515	485	504	34249	354	322
1982	180	460	415	364	414	23489	523	461
1983	NA	644	476	402	NA	94840	597	556
1984	NA	NA	NA	NA	NA	96215	NA	NA

[a]ACDA dollar figures were converted to rubles at the Soviet official rate of exchange. Although correct for Soviet trade in convertible currencies (the Soviet statistical authorities convert dollar receipts into transferable rubles using this rate of exchange), this exchange rate is less appropriate for valuing intra-CMEA trade because prices in this market differ greatly from world market prices.

skepticism since they equal the difference of two residuals, but they do provide a useful consistency check on the estimates of arms exports to the Soviet Union. As can be seen, estimates of total exports are consistent with the Soviet trade estimates. Furthermore, these estimates fall within the unidentified share of total Polish machinery exports.

Estimates of total Polish arms imports were constructed by adding Czech arms export estimates to Poland to Soviet export estimates. Czech figures were converted to rubles, and then deviza zlotys. Deviza zlotys were converted to domestic zlotys using implicit exchange rates derived from input-output data. Polish arms imports for the Soviet Union before 1978 were estimated by multiplying the share of arms in Soviet machinery exports in 1979 (the first year available) by total Soviet machinery exports to Poland.

CONSTRUCTION

As noted in Sec. II, Poland, in contrast to the other countries, divides military spending into current and investment expenditures. The latter appears to be limited to military construction. In contrast to procurement of military durables, which appears to be considered collective consumption (implying immediate depreciation), construction seems to fall under "accumulation" in the national income accounting statistics, at least since 1976. Before 1976, the category "Other Investment" in the investment chapter of the statistical yearbooks was subdivided into investments in "Administration and Law Enforcement." After that year, expenditures in that category doubled and were no longer subdivided (Table A.10). Since this change military investment fits neatly into this category, assuming that investments in "Administration and Law Enforcement" followed the trends in total "Other Investment."

In 1973 a discrepancy appeared between reported actual military expenditures and budgeted military expenditures. Alton et al. (1980) argue that expenditures on military investment (construction) are now no longer included in actual expenditure totals. Table A.10 appears to bear them out. The difference between reported actual expenditures and budgeted expenditures widened in 1973 by roughly the amount of the budget for military construction.

[9]Some input-output tables provide domestic zloty figures for imports and exports. These figures were divided by trade data to construct implicit exchange rates. The numbers are remarkably consistent over time running about 9.7 domestic zlotys to one deviza zloty.

Table A.10

POLISH MILITARY CONSTRUCTION DATA
(Millions of Zlotys)

Year	Reported Current Military Expenditures + Budgeted Investment	Reported Total Expenditures	Col (3) ÷ Col (2)	Budgeted Military Investment	Other Investment	Administration and Law Enforcement Investment
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1960	14978	14920	100.4	778	953	756
1961	16875	17018.5	99.2	775	1003	736
1962	18399	18378.5	100.1	899	933	681
1963	20628	20694.8	99.7	828	976	660
1964	21145	21880.9	96.6	845	1132	714
1965	23034	23255.1	99.0	934	1252	780
1966	24895	25213.3	98.7	995	1634	930
1967	26066	26438.3	98.6	966	1546	1068
1968	30378	30332	100.2	1478	1822	1198
1969	33539	33519	100.1	1639	2004	1426
1970	35699	35724	99.9	1615	2416	1567
1971	37805	37684	100.3	1051	2441	1714
1972	38971	39490	98.7	2000	2597	1732
1973	42290	40441	95.6	1849	3143	1839
1974	46353	43730	94.3	2623	4728	2326
1975	50204	47602	94.8	2602	4927	2557
1976	54242	51701	95.3	2541	8956	NA
1977	60932	57678	94.7	3254	9187	NA
1978	63255	59781	94.5	3474	9156	NA
1979	68192	64268	94.2	3924	9623	NA
1980	71572	66593	93.0	4979	9392	NA
1981	80560	76900	95.5	3660	6336	NA
1982	186180	175800	94.4	10380	15665	NA
1983	201380	191000	94.8	10380	18277	NA
1984	263400	250900	95.3	12500	25777	NA
1985	325170	306970	94.4	NA	NA	NA

MILITARY PRODUCTION

Arms production estimates for Czechoslovakia were calculated by adding estimates of military exports in domestic koruna to estimates of military procurement (Table A.11). Since both are upper bounds, these production figures should also be treated as such.

Table A.11

EAST EUROPEAN PRODUCTION OF MILITARY DURABLES

	Czechoslovakia		Hungary		Poland		
Year	Real Terms 1970 - 100	Nominal Terms Koruna	Real Terms 1970 - 100	Nominal Terms Forints	Real Terms 1970 - 100	Nominal Terms Zlotys	Aircraft Nominal Terms Zlotys
1960	NA	NA	35.7	232	39.1	6485	3180
1961	NA	NA	40.9	267	45.9	7668	3860
1962	NA	NA	48.3	319	53.4	8927	4830
1963	NA	NA	50.6	338	60.3	10047	5540
1964	NA	NA	51.7	349	66.7	11166	5240
1965	86.5	9261.5	49.7	342	76.2	12647	5660
1966	113.8	12223.6	49.9	354	83.7	13860	5710
1967	109.6	11947.7	47.4	368	100.6	15924	7060
1968	NA	NA	51.8	423	114.2	18207	8240
1969	72.8	8310.7	55.1	460	129.8	20794	9650
1970	100.0	11608.4	100.0	845	100.0	18011	7370
1971	NA	NA	76.5	670	113.3	20277	7610
1972	108.2	12468.1	57.8	527	113.8	20040	8660
1973	90.7	10465.4	53.1	497	133.5	23595	10010
1974	106.1	12287.6	63.9	611	157.4	17088	11520
1975	112.8	13138.6	47.9	480	207.9	38524	12560
1976	102.6	12070.8	62.5	630	223.9	42405	14360
1977	70.6	8419.2	75.1	779	248.4	47766	14450
1978	112.6	13621.0	81.8	884	270.7	54706	16210
1979	118.8	14796.4	63.3	698	280.9	56649	16090
1980	129.3	16659.7	86.9	961	268.8	60497	18510
1981	140.5	18269.7	86.0	970	246.3	57368	18050
1982	NA	NA	104.8	1215	343.9	130226	34100
1983	NA	NA	130.5	1602	286.0	148761	41260
1984	NA	NA	130.6	1689	280.5	165154	48110

Because Hungarian arms export figures were somewhat dubious, Hungarian military production was assumed to equal Hungarian domestic procurement.

Polish arms production estimates were assumed to equal the unidentified residual in Polish machinery production. Polish engineering industries production is recorded under five industries (metal-working, machinery, precision machinery, electronics and transport goods). These industries are further subdivided into branches. In general, the sum of the output of the subdivisions of the five industries does not sum to total output. This difference was assumed to set an upper limit

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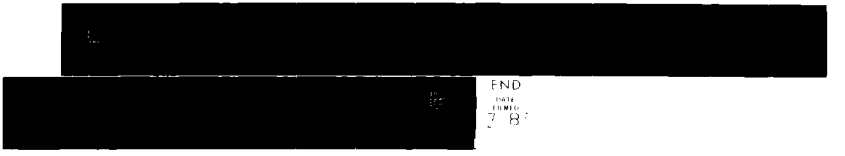

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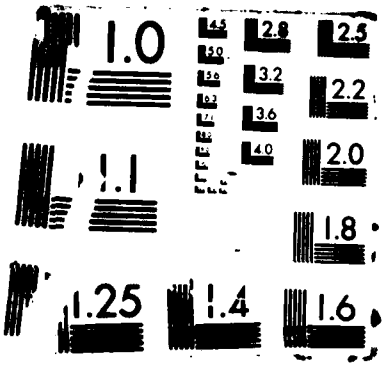
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on arms production. For example, the Poles publish a figure for the production of transport equipment, and underneath it figures for the production of motor vehicles, railroad equipment, tractors, motorcycles and bicycles, ships, and ship repair. Poland also possesses a large aircraft industry, which produces military helicopters and transports. Although the output of this industrial branch is not identified in the breakdown, the difference in the sum of the output of the identified branches and total output in this industry is about 8 percent of total output and is of the right size to encompass the Polish aircraft production.

To check the consistency of these estimates with other data, I added Polish domestic procurement estimates to estimates of arms exports to the Soviet Union. These figures fall under these military production estimates.

OPERATIONS AND MAINTENANCE

Operations and maintenance costs are notoriously difficult to estimate. Much depends on the reliability and age of the equipment and the intensity and level of operations. As noted in Sec. II, as a general rule, operations and maintenance costs run from 50 to 100 percent of personnel costs.[10] Because pay scales are low in the Warsaw Pact relative to those in NATO, and because this report attempts to set credible upper bounds on East European military spending, the higher of these two ratios was adopted.

Hungarian POL costs were estimated from the 1981 input-output table published in *Agazati Kapcsalatok Merlege*, 1981. The value of the refining industry's output in the cell in administrative and other services was assumed to set an upper bound on military POL costs. The ratio of this value to the value of the cell for the output of the chemical industry was multiplied by chemical industry inputs to set an upper limit on POL costs in other years.

RESEARCH AND DEVELOPMENT

Czechoslovakia

The Czechs divide government-funded research expenditures among the federal government, the Czech lands, and Slovakia. The Czechs note in the 1982 budget that the Czech and Slovak governments

[10]Becker, 1964.

receive "grants for the needs of military nature, including research and development programs."[11] These are the figures used in Table A.12. Expenditures using these grants would probably be recorded in the Czech and Slovak budgets, not at the federal level. These grants ran close to 5 percent of the total military budget and less than one-eighth of government expenditures on R&D. Since the military is primarily funded by the federal government, enterprise-financed military R&D is probably small. Military R&D that is funded by the enterprises must eventually find its way into the cost of the product. They may be captured in the procurement cost estimates above or in direct subsidies to enterprises not captured in these estimates.

GDR

The GDR provides a breakdown of R&D expenditures by institution or industry. Some of these categories can reasonably be excluded from military R&D, notably agricultural research, research at universities, and, less probably, the Academy of Sciences. This still leaves an extreme upper bound of over one-eighth of total R&D expenditures for military R&D, equivalent to roughly 15 percent of the reported military budgets (Table A.12).

Hungary

Hungary also provides a fairly detailed breakdown of R&D expenditures, although the budgetary data are not as detailed as those of the GDR. Because of the confusion of funding sources for R&D in Hungary, the only firm upper bound available on military R&D available from budgetary data is the entire state R&D budget, which is used here but is patently too high.

Poland

Polish R&D statistics are quite detailed, giving a total for R&D as a category and amounts budgeted for R&D by ministry. Unfortunately, this category is not listed under the budget of the Ministry of Defense. The sum of R&D budgets by ministry is almost identical to the total for R&D expenditures; the residual is not large enough to fund military R&D. This being the case military R&D is probably funded through ministries other than the Ministry of Defense, if it is included in the

[11] *Sbirka Zakonu CSSR*, #3, 1982, pp. 700–711.

Table A.12

MAXIMUM RESEARCH AND DEVELOPMENT COSTS

Year	Czechoslovakia		GDR		Hungary		Poland	
	Maximum Military R&D Costs (koruna)	Estimate/ Maximum (percent)	Maximum Military R&D Costs (marks)	Estimate/ Maximum (percent)	Maximum Military R&D Costs (forints)	Estimate/ Maximum (percent)	Maximum Military R&D Costs (zlotys)	Estimate/ Maximum (percent)
1966	NA	NA	NA	NA	NA	NA	590	61.0
1967	NA	NA	NA	NA	NA	NA	640	64.1
1968	2612	25.85	NA	NA	NA	NA	614	71.7
1969	4074	18.98	NA	NA	NA	NA	780	56.4
1970	4516	18.29	NA	NA	2489.4	5.62	749	57.4
1971	4768	18.80	764	27.5	2850.9	3.86	2019	35.2
1972	4635	20.78	812	27.1	3098.2	2.90	2503	34.0
1973	5053	20.52	834	27.6	3239.7	2.47	4511	24.8
1974	5458	18.26	842	27.3	3939.3	2.54	5275	23.7
1975	6000	18.29	867	27.7	3984.1	2.01	5241	26.3
1976	5657	19.96	923	27.1	4316.9	2.32	5167	30.6
1977	5990	19.36	1002	26.9	4604.5	2.82	6001	26.5
1978	5418	22.62	1076	27.0	4946.6	2.83	6169	25.9
1979	5248	24.17	1112.3	27.9	5290.4	2.08	6138	26.4
1980	5469	23.37	1185	27.8	5124.1	3.12	5913	27.7
1981	7196	18.20	1306.3	27.6	5415.4	2.95	4752	34.3
1982	7512	17.71	1378.3	26.8	5100	3.92	9798	27.5
1983	7856	17.42	1361.4	27.2	5200	5.00	9047	28.4
1984	8306	16.82	1220	32.0	5500	5.09	7537	NA

SOURCES: Estimates: Table 9.

Maxima: Czechoslovakia: Potential military research and development funds equal the entire republic R&D budget. Figures before 1981 are estimates based on the percentage of federal R&D in republic R&D after 1981.

GDR: These figures equal government-financed R&D expenditures for industry and for state organs.

Hungary: These figures equal the entire government-financed R&D budget.

Poland: These figures equal government-financed R&D expenditures in the Ministry of Science and Technology, the Ministry of Engineering, an unaccounted residual, and the Ministry of Heavy Industry (for years before 1970 only).

R&D total.[12] The only plausible candidates in this regard are the Ministry of Science and Technology, the Ministry of Engineering, and the Academy of Sciences. Allocations for research to other ministries appear too small and specific to hide military research. Scientific expenditures by these organizations run about one-third of total R&D expenditures and include substantial amounts of civilian research, especially research funded by the Academy of Sciences. These figures place an extreme upper bound on nationally funded military R&D in Poland.

[12]If the total figure is for civilian R&D only, the military budget may cover these costs.

Appendix B

ESTIMATING GDR INVENTORY INVESTMENT

The GDR stopped publishing information on changes in stocks in its statistical yearbook in 1979. Information before that date was given as a percent of UNI; UNI in turn was provided only in index numbers. To make rough estimates of inventory investment in nominal terms I took the figure for 1971 GDR NMP in 1980 prices and subtracted the GDR trade deficit in that year from the NMP figure. UNI index numbers were then used to create a time series in constant prices. These figures were inflated using the GDR consumer price index. The percentages of inventory investment in UNI were then used to create nominal estimates of inventory investment, which could be compared with the military budget figures. Figures are available on request from the author.

The year 1971 was chosen because GDR trade, accounted in deviza marks, was almost in balance that year. Unfortunately, trade flows in deviza marks and domestic marks, which are not reported, are not equal. By choosing a year in which the recorded balance was close to zero, I hoped that distortions caused by discrepancies in the value of the two currencies would be minimized, but some error still exists. Although the nominal values of the changes in inventories estimates may be biased for this reason, changes in these values are probably not. Consequently, the analysis in Sec. II is probably fairly reliable.

Appendix C

REGRESSION OF INVENTORY CHANGES ON MILITARY BUDGETS

If procurement of military durables is recorded in changes in inventories, procurement of military durables takes a more or less constant share of military spending, and the reported military budgets represent a fixed share of actual spending, changes in the reported military budgets should be positively correlated with changes in inventories after allowances are made for increases in both categories because of inflation and economic growth. To test this hypothesis, I regressed changes in nominal inventories on the reported military budgets and nominal utilized national income (to net out the effects of economic growth and inflation).

The results of the regressions are recorded below. All data except those for GDR inventories were taken directly from the statistical yearbooks.[1] T-statistics are given in parentheses.

Czechoslovakia	INV	=	5338.8 (1.10)	+	.149 (2.51)	×	UNI	−	2.415 (−1.76)	×	MILBUD
The GDR	INV	=	1428.3 (.56)	+	.02 (.43)	×	UNI	−	.070 (−.12)	×	MILBUD
Hungary	INV	=	6.27 (2.02)	+	.103 (2.28)	×	UNI	−	.0026 (−1.72)	×	MILBUD
Poland	INV	=	−22.94 (−1.76)	−	.072 (−1.49)	×	UNI	+	.004 (2.87)	×	MILBUD

where INV = nominal changes in total inventories, UNI = utilized national income, and MILBUD = the reported military budgets.

On the basis of these regressions the hypothesis that changes in inventories vary positively with the reported military budgets given a level of utilized national income can be rejected at the 5 percent level of significance for Czechoslovakia, the GDR, and Hungary. Only Polish inventory changes are positively correlated with changes in reported military spending.

[1]For a discussion of the derivation of figures for GDR UNI see App. B.

Appendix D

MILITARY EXPENDITURE MODEL

CHANGES IN THE SIZE OF THE BUDGET

The Model

Models of military expenditure decisionmaking in the political science literature generally assume governments are sovereign and headed by rational actors who strive to attain a level of security or power subject to various political and economic constraints. One class of such models is based on the work of Richardson (1960). These reaction models describe military spending decisions as an iterative game in which each player bases its spending decisions on its opponent's levels of spending and domestic economic resources.

Another class of models focuses on the costs and benefits of joining alliances. Olson and Zeckhauser (1966) have developed a model showing that larger powers bear a disproportionate share of the military burden in alliances because of a free rider problem. Defense is a public good; once a country is admitted to an alliance all the benefits of current levels of military expenditures occur to it, regardless of its own spending levels. Since the spending of the bigger members of the alliance generally exceeds expenditures of a smaller country, even when the latter is outside the alliance, membership in an alliance grants a smaller country more security than it could previously afford. Consequently, it can reduce its spending with only a marginal reduction in security. Larger countries do not have this option because their expenditures make a much greater difference in the military strength of the whole alliance. The weak can therefore successfully exploit the strong.

These models seem ill-suited to the process by which military spending decisions are made in Eastern Europe. The assumption of complete sovereignty implicit in these models is stretched when one is discussing the NSWP. Section IV indicates that pressure from the Soviet Union may play an important role in the expenditure decision. Moreover, alliance membership does not necessarily enhance East European security. The East Europeans find themselves entangled in a Soviet-NATO military competition in which they may prefer not to be involved. They have found that the Soviets are more willing to use force against them than against NATO. Soviet military expenditures

on its forces in Eastern Europe provide for the maintenance of Soviet domination in the region and leverage over Western Europe, as well as Soviet security. These goals are probably not shared by the NSWP, indicating other factors must be sought to explain East European membership in the Pact.

Because Eastern Europe tends to be acted upon, rather than actor, an alternative model of military expenditure decisionmaking was developed. This model assumes that East European leaderships weigh Soviet pressure, external threats, the domestic political situation, and available resources when deciding how much to spend on the military. The model is linear, implying that each of these forces enters the decisionmaking calculus independently, adding to or subtracting from overall spending levels.

Data and Estimation

The dependent variable, a real military spending index, was assumed to equal reported military expenditures deflated by the price index for nonconsumer goods and services for all countries but the GDR, where the consumer price index was used for lack of an alternative. These expenditures were converted to index numbers (1970 = 100). The index ran from 1960 to the present for all countries except the GDR. Reliable estimates of GDR military spending appear to begin in 1962. As indicated in Sec. IV, reported expenditures encompass the bulk of actual military expenditures on personnel, operations and maintenance, and procurement, so this figure is probably a good proxy for total military expenditures.

Available resources were captured using indexes for utilized national income in constant prices. Utilized national income was considered superior to net material product because the latter captures the production of material goods, not consumption. UNI better reflects what policymakers have available for military spending. Some thought was given to using Western estimates of GDP in these countries. East European policymakers presumably rely on their own statistics when making budget decisions, not Western recalculations, so I believe the official East European figures are a better reflection of what policymakers considered when making these decisions.

Changes in Soviet pressure to spend were captured by incorporating a dummy variable. The variable took on a value of one after the 1978 decision by Warsaw Pact members to respond to higher NATO spending with more spending of their own. Admittedly, the Soviets have probably varied the level of pressure to increase spending in other periods as well, but I could find no other well-documented instance of

an increase or decrease in pressure. This variable should have provided a fair test of the efficacy of Soviet pressure to increase spending in the late 1970s.

A dummy variable was also used to mark a change in East European perceptions of a threat from the West. Most reaction models used in analyzing Warsaw Pact-NATO military expenditure patterns employ Soviet and American expenditures. In this model NSWP relations with the Federal Republic of Germany were used as a proxy for a potential Western threat. The Federal Republic was chosen because it and the United States are consistently branded the potential aggressors in Bloc propaganda, and the FRG is the only NATO member that has stated a desire to alter its present borders at the expense of the NSWP (albeit peacefully). The dramatic change in NSWP-FRG relations signalled by the establishment of relations in the early 1970s also provided a convenient demarkation for a change in East European leadership perceptions of a NATO threat. Consequently, a dummy variable was used to differentiate between the periods before and after the signing of treaties and the normalization of relations between the FRG and these countries. The dummy took on a value of one the year after the treaty was signed or diplomatic relations established.

West German military budgets as a percentage of FRG GNP were also used as a proxy for external threats, but this variable was considered less satisfactory. It seems very unlikely the East European leaders keep close track of this figure or can ascribe much meaning to it. They were personally involved in drawing up and signing the treaties of the early 1970s and establishing relations. Their perceptions of West German foreign policy should be far more important in their assessment of a threat than the West German defense budget. In any event, the hypothesis that this variable had a positive effect on NSWP military spending was rejected for all countries except Czechoslovakia using a one-tail test and a 5 percent critical region.

The dummy variable for domestic disturbances was given a value of one during the year of a violent disturbance and the year following in the case of Poland, and for the 1968–1971 period for Czechoslovakia. The period for Czechoslovakia was extended for four years because of the purge of the officer corps at that time. Normalization was assumed to be more or less complete by 1972. The Polish armed forces do not seem to have suffered the same loss of confidence during the Polish crises. For these reasons, the effects of the crises on the military were not assumed to be so long lasting.

Some thought was given to using a budgetary model to explain military spending levels on the line of Davis, Dempster, and Wildavsky (1966). In these models the previous year's budget becomes an

independent variable determining the size of the following year's budget. Severe problems of multicolinearity enter the model, if the regression also includes utilized national income and the past year's budget. A more important rationale for excluding the second variable is that although it shows whether one year's budget is based on an incremental change on the last year's, it fails to explain why the change occurred in the first place.

The results of the regressions are presented in Table 14 and discussed in Sec. IV.

NATO

In order to test this model on non-Pact countries, a similar regression was run for several members of NATO. Defense expenditures deflated by the GDP price deflator were regressed against UNI in constant prices (GDP minus the current account balance), dummy variables for detente (assumed to begin in 1971), and the 1978 NATO agreement to increase military spending by 3 percent annually in real terms. Regressions were run for Belgium, Denmark, France, the Federal Republic of Germany, Italy, Luxembourg, the Netherlands, Norway, and the United Kingdom.

With the exception of the United Kingdom, the estimate of the coefficient for UNI is highly significant for all countries. More surprising is the significance of the dummy variable for the 3 percent agreement. Except for Belgium, West Germany, and Norway, these countries appear to have devoted relatively more to military spending after this agreement than they did before, compared with the performance of their economies. Although these countries may not have reached the full 3 percent specified in the agreement, they appear to have responded to the spirit of the initiative. In contrast, the coefficient for the dummy variable for detente was insignificantly different from zero at the 5 percent level. Although the West Europeans may have made a political commitment to detente, they apparently have not felt secure enough to reduce their military spending in response to the warmer political climate.

THE BUDGET AS A PERCENTAGE OF UTILIZED NATIONAL INCOME

The models described above were geared toward explaining changes in military spending over time. Also of interest is why spending varies from country to country. To answer this question the percentage of

Table D.1

THE DETERMINANTS OF MILITARY SPENDING IN NATO
(t statistics are in parentheses)

Belgium				F = 525.34				N = 24			
MILINR =	4.92	+	.97	× ABSORB	+	.27	× DETENTE	+	3.85	× AGREE	
	(.81)		(13.19)			(.08)			(1.27)		
Denmark				F = 50.63				N = 23			
MILINR =	10.93	+	.70	× ABSORB	−	5.27	× DETENTE	+	11.03	× AGREE	
	(3.53)		(5.19)			(1.01)			(2.61)		
France				F = 108.6				N = 24			
MILINR =	61.19	+	.46	× ABSORB	−	5.07	× DETENTE	+	17.83	× AGREE	
	(8.52)		(5.12)			(1.11)			(5.16)		
West Germany				F = 24.63				N = 24			
MILINR =	56.76	+	.53	× ABSORB	+	.96	× DETENTE	+	2.73	× AGREE	
	(3.77)		(2.88)			(.14)			(.48)		
Italy				F = 59.46				N = 24			
MILINR =	54.29	+	.47	× ABSORB	+	7.76	× DETENTE	+	9.97	× AGREE	
	(5.36)		(3.58)			(1.22)			(1.99)		
Luxemborg				F = 15.8				N = 24			
MILINR =	61.4	+	.74	× GDP	−	19.8	× DETENTE	+	28.3	× AGREE	
	(2.06)		(2.05)			(.99)			(1.96)		
Netherlands				F = 157.53				N = 24			
MILINR =	49.38	+	.54	× ABSORB	−	2.05	× DETENTE	+	5.60	× AGREE	
	(9.00)		(7.62)			(.62)			(2.16)		
Norway				F = 99.22				N = 24			
MILINR =	15.78	+	.82	× ABSORB	−	8.51	× DETENTE	−	5.14	× AGREE	
	(1.77)		(7.72)			(1.40)			(1.08)		
United Kingdom				F = 24.65				N = 24			
MILINR =	85.39	+	.22	× ABSORB	+	2.72	× DETENTE	+	11.93	× AGREE	
	(6.41)		(1.52)			(.54)			(3.99)		

MILINR = Reported military budgets in constant prices.

ABSORB = absorption (utilized national income).

GDP = Gross Domestic Product in constant prices.

DETENTE = a dummy variable for better Western European-Warsaw Pact political relations assumed to begin in 1971 and

AGREE = a dummy variable for the years following the 1978 NATO agreement to increase military spending by 3 percent annually

UNI devoted to the military was substituted for absolute military spending in the first model. This measure was assumed to capture different levels of effort.

An additional explanatory variable, geographic location, was incorporated into this model. TIER differentiates the Northern Tier countries that either border on the FRG or straddle Soviet lines of communication to the Central region, from Hungary, which lies on the periphery and has no borders with NATO countries.

The estimate of the coefficient of this variable was positive and highly significant. Unfortunately, this variable is too crude to differentiate between the hypothesis that the Hungarian leadership prefers to spend less than other NSWP members on the military, that geographical location is an important determinant of military spending, or that the Soviets apply more pressure on the Northern Tier countries to spend on the military than they do on Hungary. Any and all of these hypotheses could be correct. Choosing among them will probably have to rely on anecdotal evidence.

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This report provides military expenditure estimates for the Northern Tier countries of the Warsaw Pact (Czechoslovakia, the German Democratic Republic, and Poland) and Hungary, assesses the political and economic factors that determine these spending levels, and discusses the probable course of military spending in these countries over the next several years. These estimates suggest that the defense budgets reported by the East Europeans contain most major components of military spending. A statistical analysis of factors that may determine military spending levels indicates the primary determinant is available resources--i.e., utilized national income. The prospects for large surges in military spending in the next few years are therefore low.